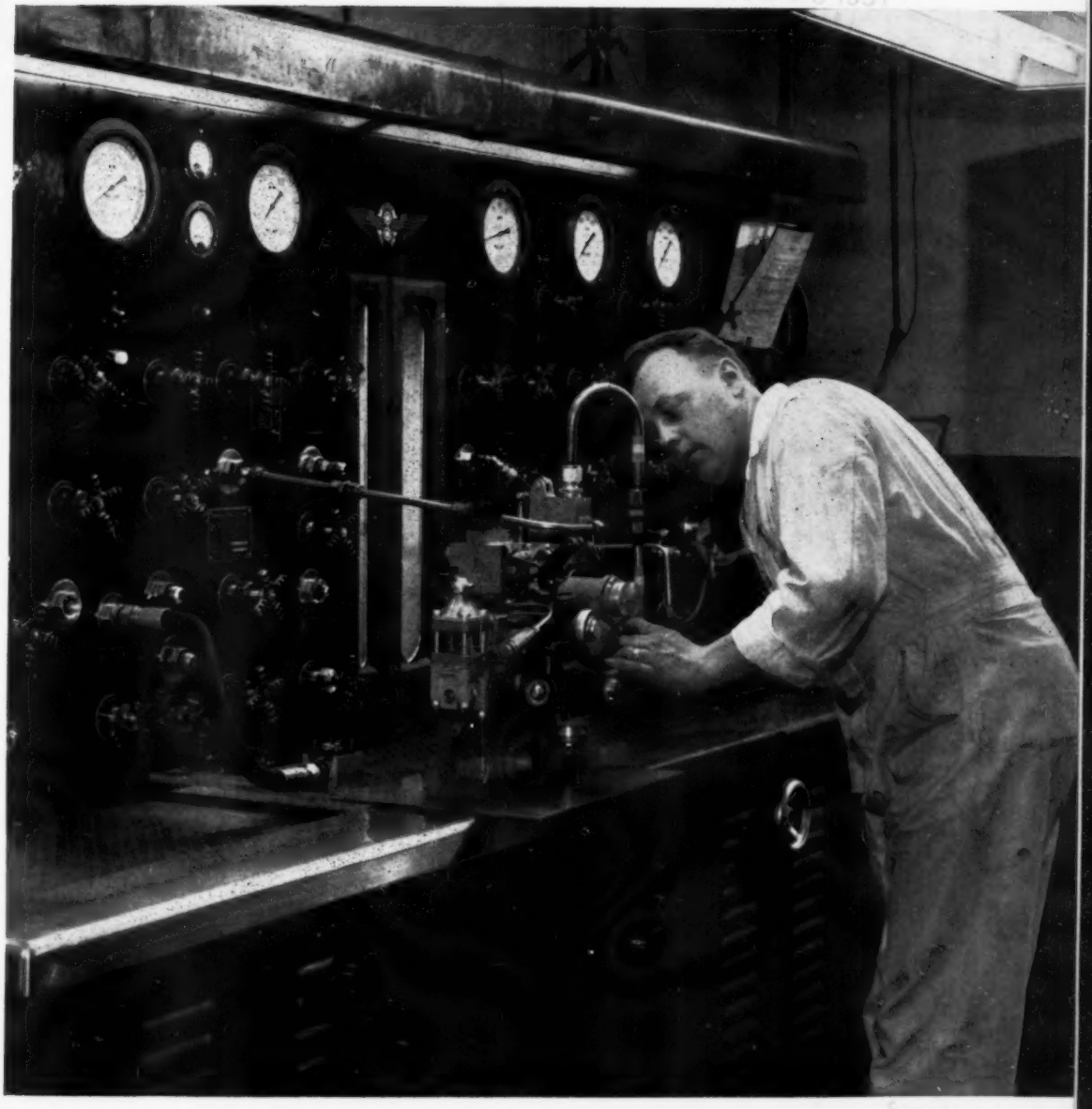
APPLIED HYDRAULICS

THE MAGAZINE OF FLUID POWER TRANSMISSION

AUG 13 1951

AUGUST, 1951

- HYDRAULIC CIRCUITS
- HYDRAULIC CONTROLS
- AIR CIRCUITS
- AIR CONTROLS
- ELECTRICAL AND ELECTRONIC CONTROLS



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PRODUCTION MEN DESIGN GM's BENDERS

THIS LITTLE TRACTOR WENT TO MARKET

VALVE SELECTION SIMPLIFIES CONTROL

ANOTHER INDUSTRY TURNS TO HYDRAULIC POWER

TEST STANDS EARN PROFIT

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August, 1951 Vol. 4, No. 8

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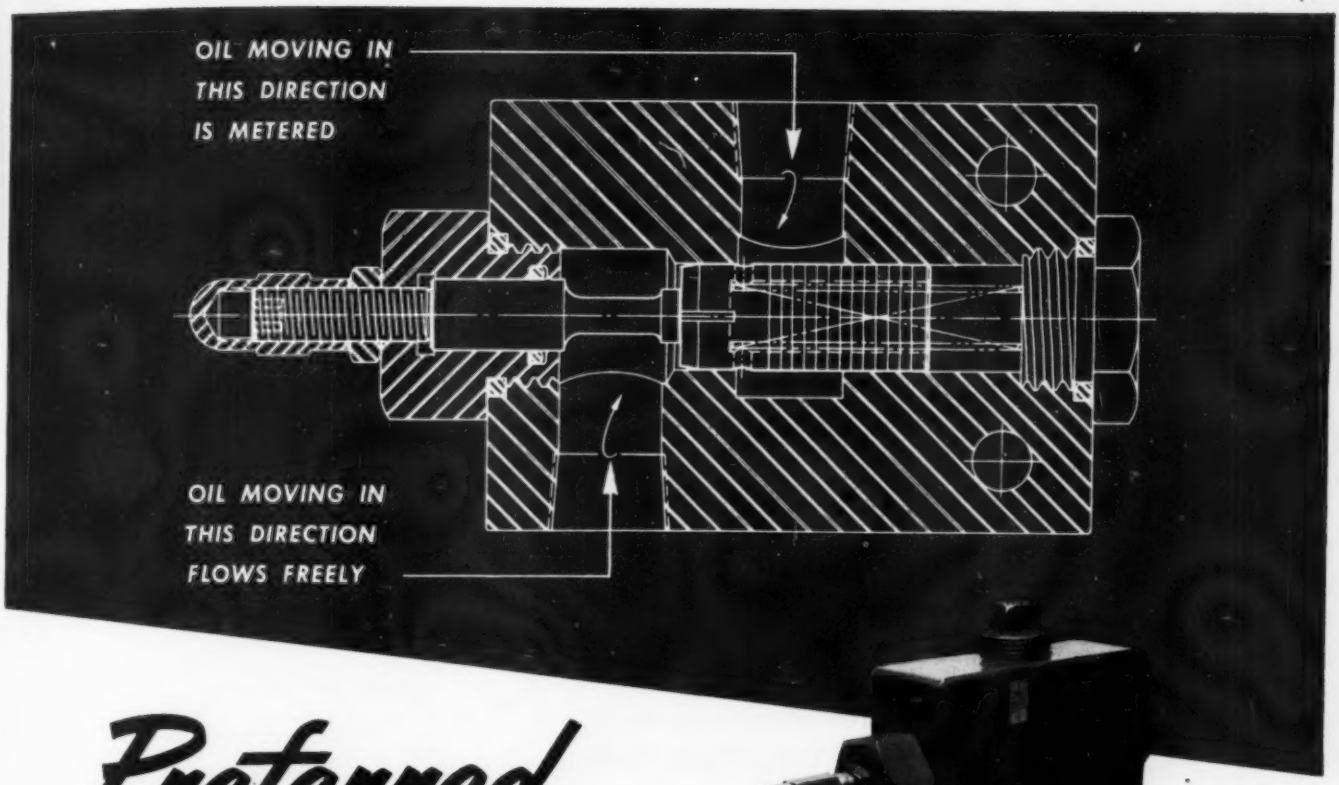
FRONT COVER: A Northwest Airlines mechanic gives a DC-4 hydraulic power manifold a static pressure test on NWA's new test stand at Holman Field maintenance base, St. Paul. More than 300 units from four types of planes are tested on this stand.

Photo Courtesy Northwest Airlines, Inc.



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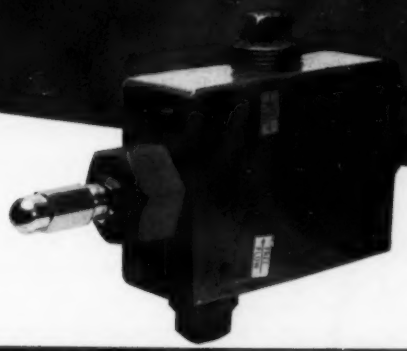

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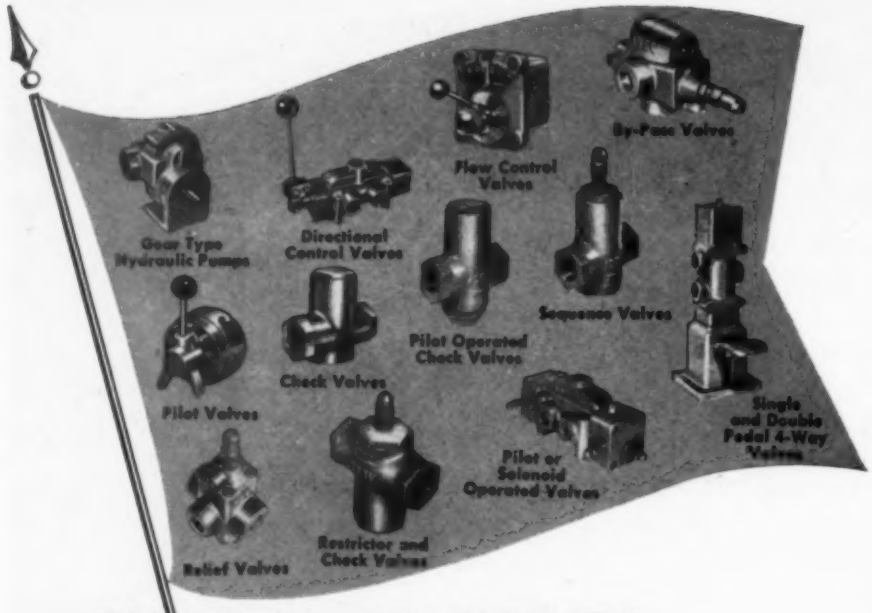

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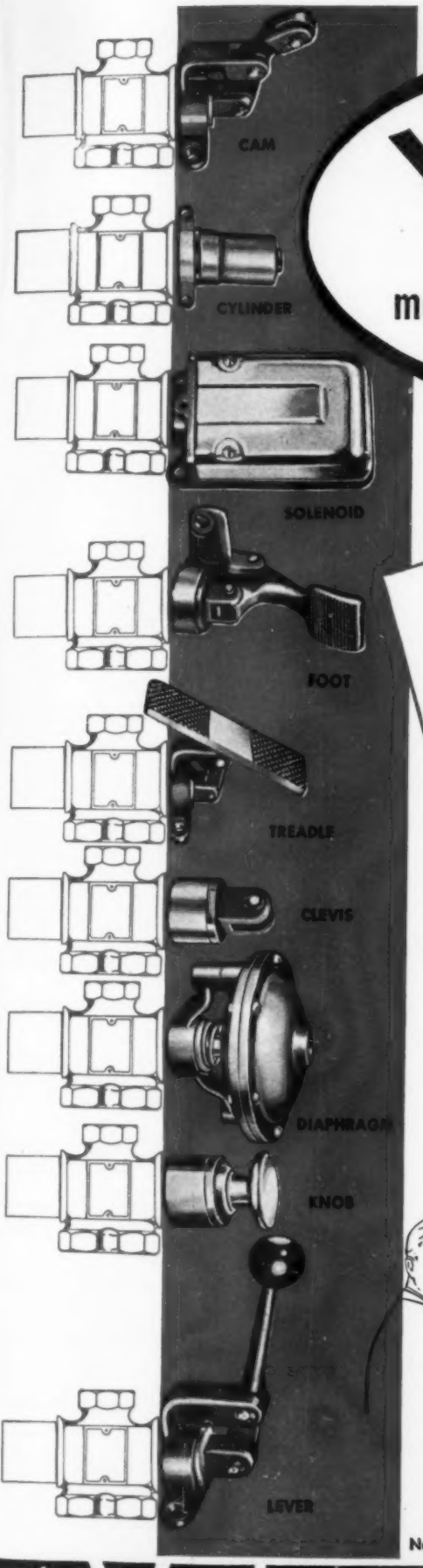

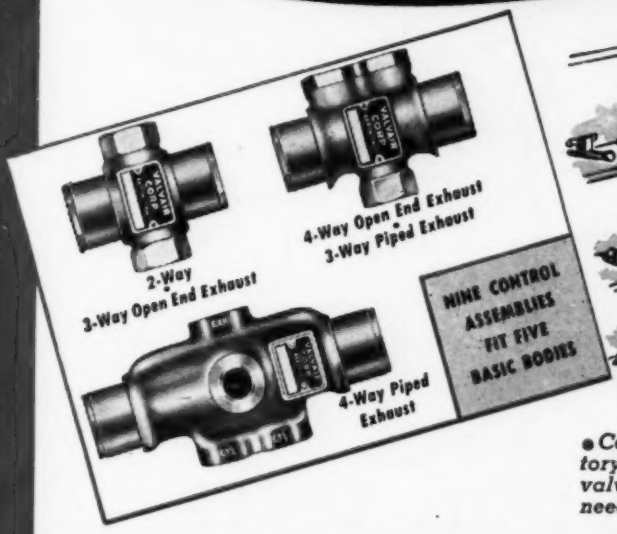

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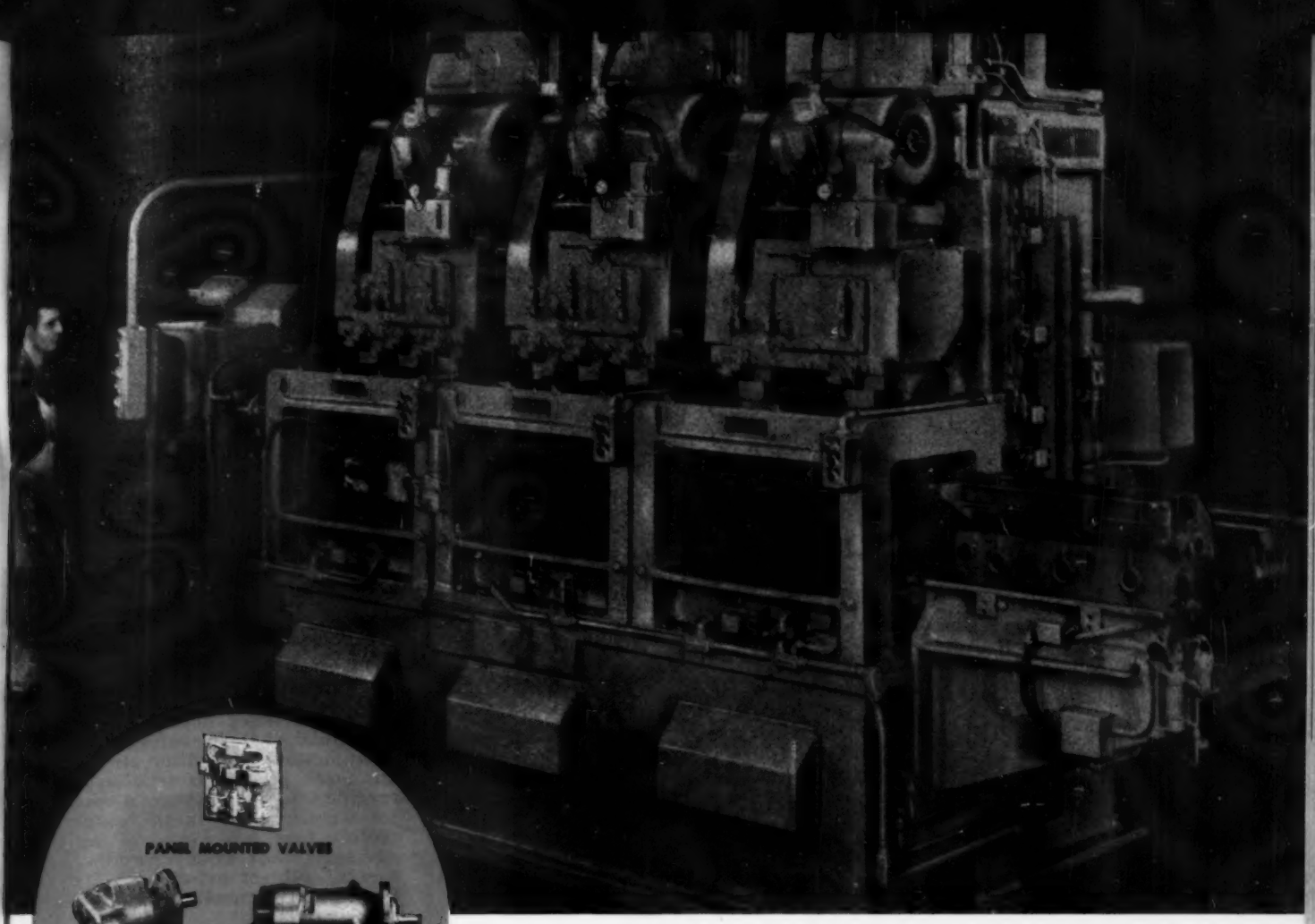

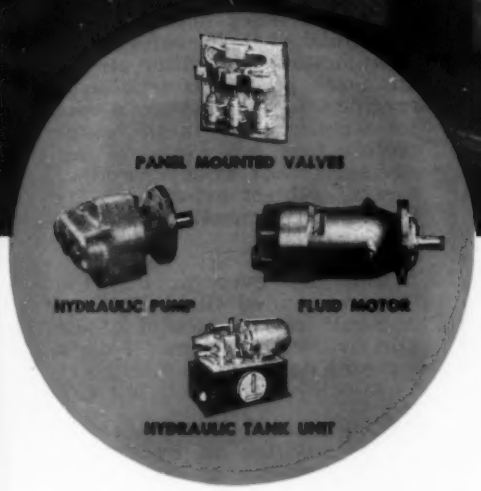

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Ethane
Fish Oils
Formaldehyde
Fresh Water
Gas, Manufactured
Gas, Natural
Gasoline
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Glue
Glycerine
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Hydrofluoric Acid
Ink
Jam
Jelly
Ketchup
Lacquer
Latex
Mash
Methane
Milk
Molasses
Naptha
Nitric Acid
Nitrogen
Oil, Crude
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Oxygen
Paint
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Propane
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Rosin
Salt Water
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Varnish
Vinegar
Viscose
Water (various)
Wax
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SEND FOR FREE BULLETIN

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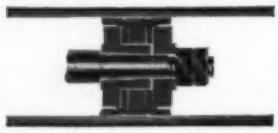
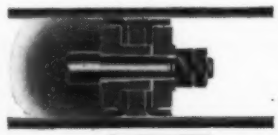
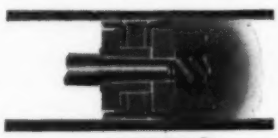
DIAGRAM OF DARCOVA PUMCUP ACTION (greatly exaggerated)



NORMAL: BOTH PUMCUPS RELAXED



UNDER PRESSURE: PUMCUPS SEAL AGAINST CYLINDER DESPITE WEAR, MINIMIZING SLIPPAGE



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DARCOVA
THE ORIGINAL COMPOSITION CUP

PUMCUPS

LETTERS to the Editor

Perhaps my eyes are in the way, or else someone clipped my copy before I got it—at any rate I was not able to find the "Know Your Symbols" sheet in the June issue of APPLIED HYDRAULICS. Have you discontinued this series?

P.G.C.

No, we have not discontinued the "Know Your Symbols" sheet. Late arrival ads were responsible for the omission. We will run this series regularly and indefinitely. Sometimes our readers are guilty of clipping articles before copies have finished their routing. One manufacturer the editor visited last week photostats articles of specific interest to them. A major manufacturer in the automotive field has a special department that does reproduction of subject articles for its technical personnel.

Did you ever publish the "Recommended Good Practice Manual" on the design of air and hydraulic systems? I am a machine designer.

W.F.B.

This manual is a project of the Committee on Pneumatics and Hydraulics, a group activity of the Los Angeles chapter of the ASME in cooperation with a number of local chapters of other technical societies. The last information we have is that the work has practically stopped due to the heavy load of work committee members are now carrying. The project has not been abandoned and we hope to report progress in the fall.

I am a student at General Motors Institute and I am collecting material for a paper on the use of hydraulics in industry. I have found much interesting and useful information in APPLIED HYDRAULICS. However, I would like more information on the growth and development of hydraulics, from its earliest beginning until the present time. Can you inform me if such information exists in book form and, if so, where it is available?

D.L.G.

Unfortunately, very little has been written on the growth and development of hydraulics

(Continued on page 14)

BOOST 80 PSI AIR

(Input Range: 40 to 3000 psi Air or Fluid)

TO . . . 2000 PSI HYDRAULIC PRESSURE

(Output Range: 200 to 10,000 psi Fluid)

with Miller

Fluid Pressure BOOSTERS

From ordinary plant air line pressure, Miller Boosters produce hydraulic pressures (from 200 to 10,000 psi) for driving one or more hydraulic work cylinders simultaneously at from 30 to 450 strokes per minute. Ordinarily, the booster operates one stroke for each stroke of the operated work cylinders.

Used in place of conventional type hydraulic pumps, Miller Boosters save space and weight, permit convenient portability and are easier and less costly to install, operate, and maintain. Also, they hold pressure *indefinitely —without the motion and heat generation of ordinary pump circuits.*

Used in place of air cylinders, the booster driven hydraulic work cylinder, which can do the work of an air cylinder ten times as large and heavy, saves space and weight at point of application of cylinder thrust—since the booster itself can be mounted separately—away from the hydraulic work cylinder—and either on or off the equipment or machine.

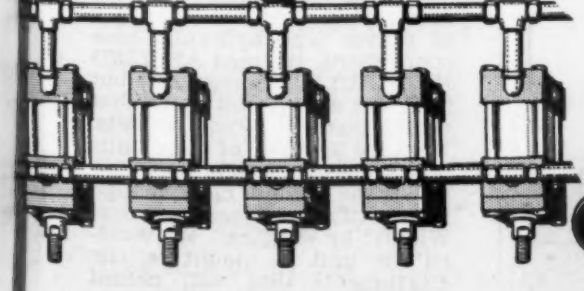
In many installations, the popular Miller Dual Pressure "Air Miser" Booster *saves up to 95% of the air* normally consumed by direct-driven air cylinders.

A wide selection of sizes, pressure ratios and mounting styles are available for the first time at low cost on a normal delivery schedule because Miller Boosters are built up from stock Miller standard cylinder parts to eliminate costly designs, patterns and castings.

Especially recommended for . . .

- WELDING
- PUNCHING
- SHEARING
- CLAMPING
- RIVETING
- CRIMPING
- PRESSING

and SIMILAR APPLICATIONS



Full Details In Miller Bulletin B-200 Sent FREE On Request

OTHER MILLER PRODUCTS INCLUDE: AIR CYLINDERS, 1½" to 20" BORES, 200 PSI OPERATION; LOW PRESSURE HYDRAULIC CYLINDERS, 1½" TO 6" BORES FOR 500 PSI OPERATION, 8" TO 14" BORES FOR 250 PSI; HIGH PRESSURE HYDRAULIC CYLINDERS, 1½" TO 12" BORES, 2000-3000 PSI OPERATION. ALL MOUNTING STYLES AVAILABLE.

Miller

MILLER MOTOR COMPANY

2008 N. HAWTHORNE, MELROSE PARK, ILL.

AIR AND HYDRAULIC CYLINDERS · ACCUMULATORS · COUNTERBALANCE CYLINDERS · BOOSTERS · AIR HOISTS

CLEVELAND — PITTSBURGH — PHILADELPHIA — DETROIT — YOUNGSTOWN — BOSTON
HARTFORD — NEW YORK CITY — DAYTON — ST. PAUL — FORT WAYNE — INDIANAPOLIS
MILWAUKEE — NASHVILLE — SEATTLE — LOS ANGELES — SAN FRANCISCO — BALTIMORE
ST. LOUIS and OTHER AREAS.

s and Service from coast to coast

Wanta pump something at lower cost?

CHECK HERE

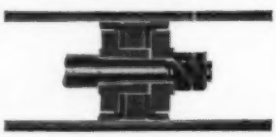
Air
Alcohol
Ammonia
Beer
Benzol
Boiler Feed Water
Brewer's Mash
Butter
Butane
Cane Syrup
Calcium Carbonate Slurry
Calcium Sulfate Slurry
Casein Solutions
Cement Slurry
Chocolate
CO_2 Gas
Crude Oil
Dairy Products
Dye Solutions
Edible Oils
Ethane
Fish Oils
Formaldehyde
Fresh Water
Gas, Manufactured
Gas, Natural
Gasoline
Glucose
Glue
Glycerine
Glycols
Hydrochloric Acid
Hydrofluoric Acid
Ink
Jam
Jelly
Ketchup
Lacquer
Latex
Mash
Methane
Milk
Molasses
Naptha
Nitric Acid
Nitrogen
Oil, Crude
Oil, Refined
Oxygen
Paint
Potassium Hydroxide
Propane
Raw Boiler Feed Water
River Water—Dredging Operations
Rosin
Salt Water
Shortening
Sludge
Soap
Sodium Chloride Solution
Sodium Silicate
Sodium Sulfate Solution
Starch
Sulphuric Acid
Sump Water
Sweet Water
Tomato Juice
Varnish
Vinegar
Viscose
Water (various)
Wax
Whey

THIS list of fluids will give you a rough idea of the diversity of pumping jobs in which Darcova Pumcups are responsible for really *big* savings.

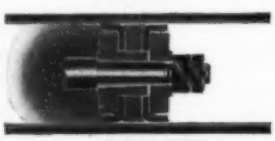
It boils down to the fact that Pumcups all but eliminate fluid slippage *throughout* their life span . . . and they *last many times as long as other packings.* Think of the down-time avoided, the production gains due to prolonged high efficiency, and the time-and-money-saving reduction in maintenance!

Years of application research have gone into the development of Pumcups. Made today in standard as well as many special compositions and textures for a wide range of temperature and pressure conditions, they offer you superior cost-cutting service in virtually *any* pumping job, simple or tough! And they're available in diameters from 1 to 20 inches.

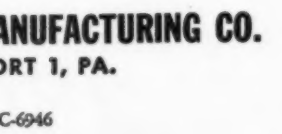
DIAGRAM OF DARCOVA PUMCUP ACTION (greatly exaggerated)



NORMAL: BOTH PUMCUPS RELAXED



UNDER PRESSURE: PUMCUPS SEAL AGAINST CYLINDER DESPITE WEAR, MINIMIZING SLIPPAGE



SEND FOR FREE BULLETIN

Why not weigh *all* the facts? Bulletin 4401 covers Darcova Pumcups for reciprocating pumps; Bulletin 4502 on Pumcups for air or hydraulic mechanisms. Write for yours today.

DARLING VALVE & MANUFACTURING CO.
WILLIAMSPORT 1, PA.

C-6944 C-6946

DARCOVA
THE ORIGINAL COMPOSITION CUP
PUMCUPS

Perhaps my eyes are in the way, or else someone clipped my copy before I got it—at any rate I was not able to find the "Know Your Symbols" sheet in the June issue of APPLIED HYDRAULICS. Have you discontinued this series?

P.G.C.

No, we have not discontinued the "Know Your Symbols" sheet. Late arrival ads were responsible for the omission. We will run this series regularly and indefinitely. Sometimes our readers are guilty of clipping articles before copies have finished their routing. One manufacturer the editor visited last week photostats articles of specific interest to them. A major manufacturer in the automotive field has a special department that does reproduction of subject articles for its technical personnel.

Did you ever publish the "Recommended Good Practice Manual" on the design of air and hydraulic systems? I am a machine designer.

W.F.B.

This manual is a project of the Committee on Pneumatics and Hydraulics, a group activity of the Los Angeles chapter of the ASME in cooperation with a number of local chapters of other technical societies. The last information we have is that the work has practically stopped due to the heavy load of work committee members are now carrying. The project has not been abandoned and we hope to report progress in the fall.

I am a student at General Motors Institute and I am collecting material for a paper on the use of hydraulics in industry. I have found much interesting and useful information in APPLIED HYDRAULICS. However, I would like more information on the growth and development of hydraulics, from its earliest beginning until the present time. Can you inform me if such information exists in book form and, if so, where it is available?

D.L.G.

Unfortunately, very little has been written on the growth and development of hydraulics

(Continued on page 14)

BOOST
80 PSI AIR

(Input Range: 40 to 3000 psi Air or Fluid)

TO . . .
2000 PSI HYDRAULIC PRESSURE

(Output Range: 200 to 10,000 psi Fluid)

with Miller

Fluid Pressure BOOSTERS

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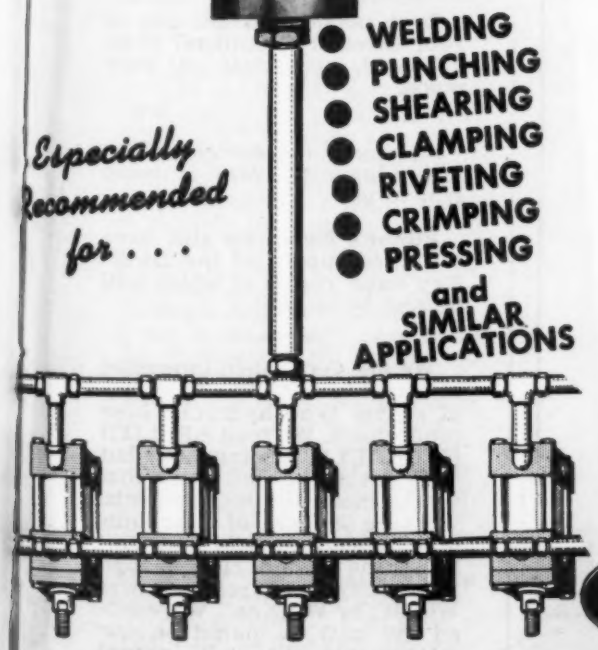
- PRESSING

and SIMILAR APPLICATIONS



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Miller

MILLER MOTOR COMPANY

2008 N. HAWTHORNE, MELROSE PARK, ILL.

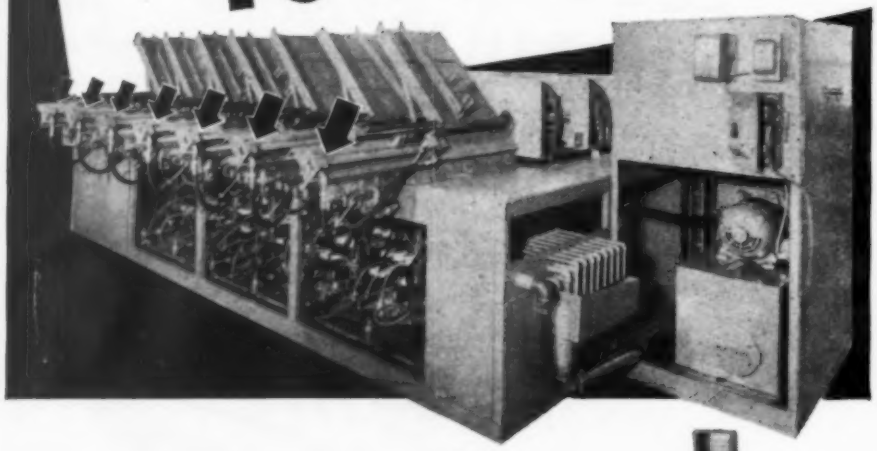
AIR AND HYDRAULIC CYLINDERS · ACCUMULATORS · COUNTERBALANCE CYLINDERS · BOOSTERS · DIE HOISTS

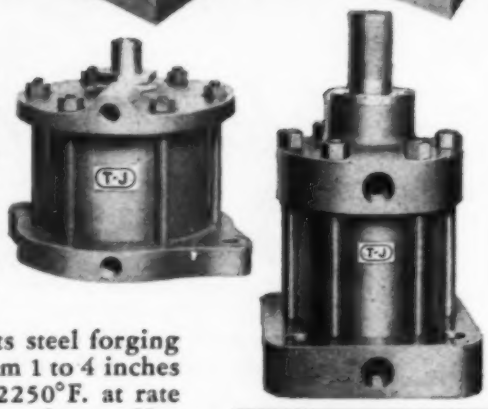
CLEVELAND — PITTSBURGH — PHILADELPHIA — DETROIT — YOUNGSTOWN — BOSTON
HARTFORD — NEW YORK CITY — DAYTON — ST. PAUL — FORT WAYNE — INDIANAPOLIS
MILWAUKEE — NASHVILLE — SEATTLE — LOS ANGELES — SAN FRANCISCO — BALTIMORE
ST. LOUIS and OTHER AREAS.

es and Service from coast to coast

Job File No. 3259

Feeds Automatically WITH T-J CYLINDERS



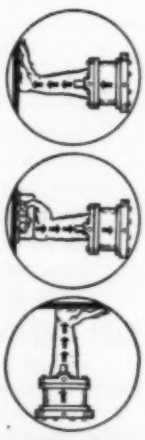


T-J Hydraulic Cylinders furnish efficient, automatic "push power" for feeding devices in this new Ajax-Northrup induction forge heating equipment.

This unit—manufactured by Ajax Electrothermic Corp., Trenton, N. J.—automatically heats steel forging stock in sizes ranging from 1 to 4 inches (rounds or squares) at 2250°F. at rate of 7500 to 8500 lbs. per hour. Has space for 8 heating stations . . . each with *hydraulically operated billet feeding devices employing T-J Cylinders.* These cylinders also eject heated bars automatically. Induction heating with this equipment results in uniformity of successive billets fed to the forge—thus controlling quality of finished forgings and reducing rejects.

Do you have a tough job in power movement—pushing, pulling or lifting? Let T-J help you *simplify machines, save labor* and *cut costs* by using T-J Air or Hydraulic Cylinders! Many standard sizes and styles . . . cushioned or non-cushioned . . . 100 lb. or 50,000 lb. Precision-built, long life. Write for more information. The Tomkins-Johnson Co., Jackson, Mich.

FOR POWER MOVEMENT IN ANY DIRECTION



100 LBS. or 50,000 LBS.

35 YEARS EXPERIENCE

TOMKINS-JOHNSON

RIVITORS . . . AIR AND HYDRAULIC CYLINDERS . . . CUTTERS . . . CLINCHORS

T-J

Circle 15 on Reader Service Card

Letters to the Editor

(Continued from page 10)

from a historical or long range development point of view. We ran some letters and comments on very early applications of hydraulics to industrial equipment in the October and November 1950 issues of this column. The best bet is to contact the veterans in the industry. However, we are enclosing a copy of the APPLIED HYDRAULICS Data List from which you will be able to glean major pertinent facts.

We would appreciate it very much if you would suggest a make of check valve that would be consistently leakproof at 600 psi water pressure. These valves are needed to assure a proper operation of a hydraulic testing equipment for compressed gas (LP) cylinders. Only one of several hydraulic circuits, the one that supplies test pressure has to be operated by water and we are experiencing grave difficulties with leakage of check valves, the design of which is suitable for oil operation but proved quite unreliable when used on water.

G.W.J.

It seems that you are trying to use a check valve designed for oil on a water system. At the pressures indicated you should use a valve designed for water operation. A ball or poppet, not a swing check type should be selected. We are confident that if you consult with one or more of the representatives whose names we are sending you that a satisfactory solution will be worked out.

Is it possible to get one of your Directory numbers? If so, I would appreciate it very much.

R.A.

A copy of the current Directory (January 1951) is being sent to you.

Editor's Note: *We still have a limited supply of the Directory issue, copies of which will be sent on request.*

We are very much interested in securing a source of supply of swivel type hydraulic hose connections. We read APPLIED HYDRAULIC ads regularly but have not seen a unit listed that would meet our requirements. We have seen one of these units on a Yale fork truck, the coupling name was not clear enough to identify it—it seems it was Widgit" or Wiggins". We wanted the unit to mount on our attachments that will permit

(Continued on page 19)

(Continued from page 14)

the 90 degree angle to swivel, as the attachment moves upward and downward.

E.C.J.

The swivel type connection you refer to probably was made by the E. B. Wiggins Oil Tool Co., Inc., 3424 East Olympic Blvd., Los Angeles 23, Calif. Other manufacturers of this type of connection are listed under the heading "Revolving Joint" in the 1951 APPLIED HYDRAULICS Directory (January issue).

We have a number of men working in our shop who are interested in furthering their education in hydraulics. They have been reading your articles "Beginners Course in Basic Hydraulics" regularly. I understand that a good deal of this information is contained in a book published by the Navy and these men have requested copies. Will you advise me where copies may be obtained?

J.R.MCG.

The Navy wartime training text, "Basic Hydraulics" is available from the Superintendent of Public Documents, United States Government Printing Office, Washington 25, D.C. at $1.50 per copy.

Do you plan to reprint the installments of the Beginner's Course that cover pumps? We could use 10 copies to good advantage.

We have no plans to reprint the Beginner's Course. We suggest you collect the pages from your copies (January 1951 on) and blueprint or photostat them.

Reference is made to your answer to B.A.H. in the May 1951 issue of APPLIED HYDRAULICS concerning a small hydraulic cylinder having a bore up to 2 inches and a maximum stroke of 1 inch, which is capable of operation at 400 psi. You will have to be corrected in that this hydraulic cylinder is a standard manufactured item. A hydraulic cylinder, made by the Compressed Air Products, 1977 Springfield Ave., Maplewood, N. J. has a bore of 1 inch with an actuating rod of ⅜ inch or ½ inch diameter, length of stroke as required, 1500 psi maximum operating pressure, double acting, with ¼ inch pipe thread connections. This type of unit has given me excellent results using 500 psi nitrogen gas to operate it, with very little leakage encountered. I hunted a long time to find one and can appreciate B. A. H.'s problem.

G.D.C.

TROSTEL *Engineered* PACKINGS

OIL SEALS

LEATHER LABORATORY

SYNTHETICS LABORATORY

IMPREGNATIONS LABORATORY

THREE separate and distinct laboratories to solve your sealing problems

Good packings design requires exact answers to specific hydraulic, pneumatic, or fluid retention problems with rubber or leather.

Supplying these facts is the important function of Trostel research—supplying them out of experience wherever possible; developing new compounds and impregnations where existing materials are found wanting.

The end result is a thoroughly tested design based on known operating data; one that can be produced economically, in quantity, under rigid laboratory control.

We invite you to join the many well-engineered companies who have found these services both indispensable and profitable.

Illustrated bulletin on request.

ALBERT TROSTEL & SONS COMPANY
Packings Division • Milwaukee 1, Wisconsin
Since 1858

TROSTEL engineered PACKINGS

Circle 20 on Reader Service Card

HIGHER EFFICIENCY

with light aircraft oils or heavy industrial oils

DENISON HydrOILics

High-Pressure, High-Volume PUMPS for All Circuit Needs to 5000 psi

Here's high-pressure, high-volume efficiency on a wide range of ruggedly built pumps. They feature complete hydraulic balance that eliminates the use of thrust bearings . . . simplified construction that requires fewer parts . . . exclusive axial piston design that assures longer, maintenance-free service, *and many other advantages.*

Denison HydrOILic Pumps include constant-volume and variable-volume types for all circuit requirements up to 5000 psi, with volume delivery capacities ranging from 2 to 35 gpm. Variable-volume types are available with stem, handwheel, or compensator control. A choice of face, flange or foot mountings is offered on all of these pumps.

Increasing demands for modern high-pressure systems, and the resulting need for compact hydraulic units built to withstand long, hard high-pressure operation, have led to the wide preference for Denison Pumps.

The tougher the job, the quicker you discover the advantages of Denison HydrOILic Pumps, developed through 25 years of experience in designing and building oil-hydraulic equipment *exclusively.* Put these advantages to work in your hydraulic circuits — for either intermittent or continuous service.

Write today for full details on pumps to fit your needs.

The DENISON Engineering Co., 1166 Dublin Rd., Columbus 16, Ohio

DENISON PUMPS

Circle 21 on Reader Service Card

LITERATURE AND SERVICES OFFERED IN THIS MONTH'S ADS

AIR VALVES OPERATED by solenoid action are illustrated in catalog sheets available from C. B. Hunt & Son Inc.

Circle 63 on Reader Service Card

"HOW TO SOLVE PUMPING PROBLEMS" is the title of a booklet offered by Geo. D. Roper Corp. giving you quick facts that are real time-savers in the selection of positive displacement pumps.

Circle 28 on Reader Service Card

PNEUMATIC DEVICES for aircraft are described in catalogs and data sheets available from Walter Kidde & Company.

Circle 36 on Reader Service Card

BULLETIN 500 issued by Ledeen Mfg. Co. describes their line of air and oil cylinders.

Circle 53 on Reader Service Card

HOSE ASSEMBLIES AND FITTINGS designed by Anchor Coupling Co. are the subject of available literature.

Circle 31 on Reader Service Card

PUMP BULLETIN offered by Brown & Sharpe gives data on their wide range of gear pumps for 500 psi applications.

Circle 25 on Reader Service Card

"O" RING CATALOG giving size and application data is available from Minnesota Rubber & Gasket Co.

Circle 78 on Reader Service Card

HOSE SPECIFICATION SHEETS PREPARED BY Resistoflex Corporation gives service and size recommendations.

Circle 29 on Reader Service Card

GREER BULLETIN 301 gives detailed information and circuits showing how to apply accumulators to hydraulic systems.

Circle 19 on Reader Service Card

GEAR PUMPS for applications up to 1500 psi are detailed in the current Gerotor Catalog.

Circle 23 on Reader Service Card

MODEL BL HI-CYCLIC valve for variable control of piston speed is described in data sheets offered by The Beckett-Harcum Company.

Circle 46 on Reader Service Card

GEARSHIFT DRIVES are illustrated in bulletins offered by The Lima Electric Motor Company.

Circle 64 on Reader Service Card

BULLETIN 210 provides valuable application and dimensional data on Hannifin Cylinders.

Circle 58 on Reader Service Card

LIGHT WEIGHT fluid motors and pumps for speeds to 3450 rpm and pressures to 1000 psi are described in literature prepared by Eastern Industries, Inc.

Circle 52 on Reader Service Card

SERVICE DATA SHEETS on long service, low cost lead base babbitt are available for the American Crucible Products Co.

Circle 51 on Reader Service Card

SOLVING TEST PROBLEMS on hydraulic systems is the service offered by Sprague Engineering & Sales.

Circle 32 on Reader Service Card

MANY APPLICATIONS FOR Nicholson control valves for pressures to 5000 psi are illustrated in Catalog 1250.

Circle 57 on Reader Service Card

PACKINGS FOR RECIPROCATING pumps and air and oil cylinders are detailed in Darling Valve and Manufacturing Co.'s Bulletin 4502 and 4401.

Circle 11 on Reader Service Card

DESIGNED WITH A CARTRIDGE type packing gland to J.I.C. Standards, specifications for Petch cylinders are given in available data sheets.

Circle 47 on Reader Service Card

VARIABLE VOLUME PUMPS built by Racine are described in 3-color catalog P-10-D.

Circle 80 on Reader Service Card

BULLETIN H-210 issued by Yarnall-Waring illustrates their two-pressure valves for systems up to 5000 psi.

Circle 48 on Reader Service Card

VALVE CATALOG 23 issued by Automatic Switch Co., gives complete data on automatic control valves.

Circle 39 on Reader Service Card

(Continued on page 26)

PACKAGED POWER

in pressure capacities from 400 to 5000 psi

Pumping Units for Highest Efficiency on Every Type of Circuit

DENISON HydrOILics

You get extra ruggedness and efficiency *plus lowest operating costs* when you select Denison HydrOILic Pumping Units. Built in 37 different models, they meet any circuit need that calls for a pressure capacity of from 400 to 5000 psi . . . for constant or variable volume operation . . . with volume control by hand wheel, stem or pressure compensation . . . volume deliveries from two to 35 gpm. Capacities of the oil reservoirs range from 16 to 165 gallons.

One of the big reasons for the fine performance records of these high-pressure, high-volume pumping units is that they are built around the famous HydrOILic axial piston pumps, described on the opposite page. These hydraulically balanced pumps have shown exceptionally high volumetric efficiencies in repeated tests made at operating pressures up to 5000 psi.

Single-panel mounting of motor, pump, relief valve, gauges and controls permits quick, easy, low cost maintenance — and adds to compact assembly that simplifies circuit arrangements. All larger series units are of horizontal design, and meet JIC standards.

You get the benefits of *proved performance* backed by 25 years of specialized experience in building oil-hydraulic equipment, when you power your circuits with Denison HydrOILic Pumping Units! Write for further information.

The DENISON Engineering Co., 1166 Dublin Rd., Columbus 16, Ohio

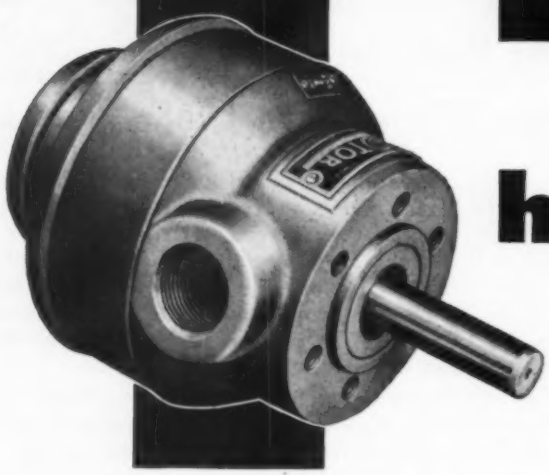
DENISON PUMPING UNITS

Circle 22 on Reader Service Card

if your design calls for a hydraulic circuit

if you want efficient, dependable performance

specify GEROTOR



hydraulic PUMPS

Exclusive GEROTOR elements revolve in the same direction at low relative speed, resulting in less wear, longer life. Continuous fluid-tight tooth engagement means less slippage, more uniform flow. Pressures up to 1000 p.s.i., continuous duty; in some sizes, up to 1200 p.s.i. continuous, 1500 intermittent. Plain, base or flange mounting. Write for catalog.

GEROTOR hydraulic pumps and motors

GEROTOR MAY CORPOATION, Baltimore 3, Maryland

"Tycol Avalon resists corrosion... smooths out hydraulic operations"

It's so! Tycol Avalon Oils make smooth, even hydraulic performance possible, no matter what the temperature. They provide maximum resistance to emulsification . . . permit continuous operation with minimum wear.

Tycol Avalon Oils have reduced hydraulic system costs in hundreds of operations . . . performing superbly and assuring minimum wear of pumps and packings. A selection of grades is available for every use.

Contact the nearest Tide Water Associated office for complete information. Call or write today.

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INDUSTRIAL LUBRICANTS

Boston • Charlotte, N. C. • Pittsburgh
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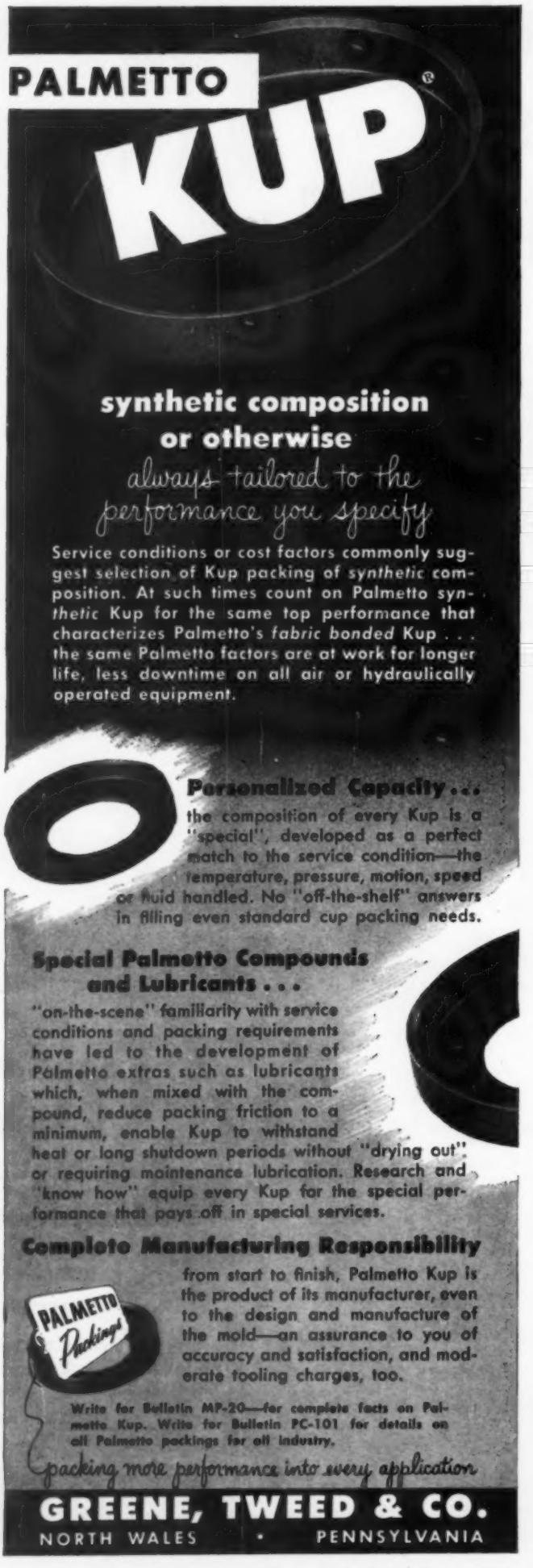
TIDE WATER ASSOCIATED OIL COMPANY

17 BATTERY PLACE - NEW YORK 4, N. Y.

SEND FOR A FREE COPY OF "TIDE WATER ASSOCIATED LUBRICANIA"


PALMETTO
KUP
synthetic composition
or otherwise
always tailored to the
performance you specify
Service conditions or cost factors commonly suggest selection of Kup packing of synthetic composition. At such times count on Palmetto synthetic Kup for the same top performance that characterizes Palmetto's fabric bonded Kup . . . the same Palmetto factors are at work for longer life, less downtime on all air or hydraulically operated equipment.
Personalized Capacity . . .
the composition of every Kup is a "special", developed as a perfect match to the service condition—the temperature, pressure, motion, speed or fluid handled. No "off-the-shelf" answers in filling even standard cup packing needs.
Special Palmetto Compounds and Lubricants . . .
"on-the-scene" familiarity with service conditions and packing requirements have led to the development of Palmetto extras such as lubricants which, when mixed with the compound, reduce packing friction to a minimum, enable Kup to withstand heat or long shutdown periods without "drying out" or requiring maintenance lubrication. Research and "know how" equip every Kup for the special performance that pays off in special services.
Complete Manufacturing Responsibility
from start to finish, Palmetto Kup is the product of its manufacturer, even to the design and manufacture of the mold—an assurance to you of accuracy and satisfaction, and moderate tooling charges, too.
PALMETTO Packings
Write for Bulletin MP-20—for complete facts on Palmetto Kup. Write for Bulletin PC-101 for details on all Palmetto packings for all industry.
packing more performance into every application
GREENE, TWEED & CO.
NORTH WALES • PENNSYLVANIA

(Continued from page 21)

TOMKINS-JOHNSON offers information on air and hydraulic cylinders to help you simplify machines and cut production costs.

Circle 15 on Reader Service Card

TEST SERVICE for hydraulic components to 5000 psi and to meet AN qualifications is offered by Aircraft Equipment Testing Company.

Circle 61 on Reader Service Card

SHAFT SEALING recommendations are available from the Sealol Corporation.

Circle 42 on Reader Service Card

RECIPROCATING PUMP applications for hydraulic systems are detailed in Data Sheets 64 and 64B prepared by The Aldrich Pump Co.

Circle 18 on Reader Service Card

BULLETIN SW-1 gives data and description on Galland-Henning NO-PAK valves and cylinders for air and hydraulic service.

Circle 67 on Reader Service Card

STAINLESS STEEL HOSE ASSEMBLIES for experimental and production application are described in information available from Avica Corporation.

Circle 38 on Reader Service Card

FOLDER 105, offered by Marvel Engineering Company gives application and size data on their synclinal oil filters.

Circle 43 on Reader Service Card

HYDRAULIC VALVE data and specifications are supplied in a new Double A Products Co. catalog.

Circle 6 on Reader Service Card

PIPE PLUGS providing positive sealing under extreme pressure are shown in Bulletin 675 offered by Standard Pressed Steel Company.

Circle 60 on Reader Service Card

MOLDED PACKINGS are the subject of a new catalog prepared by Periflex Inc. giving the wide range of standard molds carried in stock.

Circle 59 on Reader Service Card

CUSHION TYPE CYLINDERS with interchangeable mountings are described in a bulletin available from Modernair Corporation.

Circle 41 on Reader Service Card

Circle 27 on Reader Service Card

Seventh N.C.I.H. to Hold November Meeting

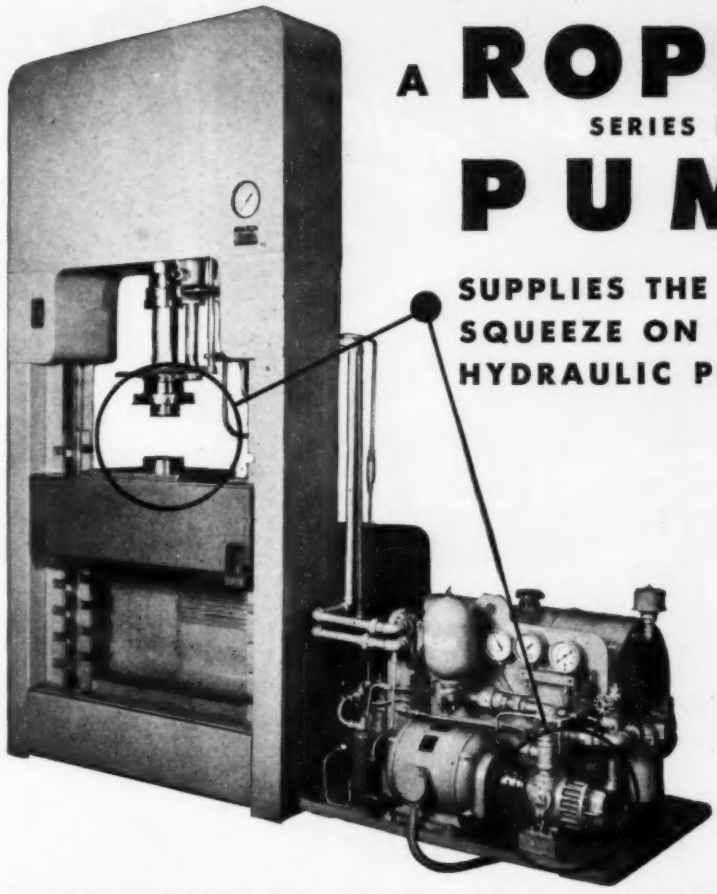
THE SEVENTH ANNUAL National Conference on Industrial Hydraulics will be held November 8 and 9 in the Sherman hotel in Chicago. The announcement was made by the recently appointed conference director, John J. Slomer, Goodman Manufacturing Company.

The two-day meeting will be devoted to the presentation of significant technical papers by authoritative speakers on the latest developments in the industrial hydraulics field. As inaugurated last year, sectional conferences will be held so that registrants will be able to arrange their attendance most profitably.

An executive committee of 15 representatives of the sponsoring groups and industry are well along with plans for what promises to be the outstanding sessions in N.C.I.H. history. These men are: C. J. Clark, Ingersoll-Rand Co.; C. L. Conroy, Anchor Coupling Co.; J. G. Duba, Illinois Institute of Technology; E. Montford Fucik, Harza Engineering Co.; J. T. Greenlee, Imperial Brass Co.; Lewis H. Kessler, Northwestern U. Technological Institute; Robert C. Kintner, Illinois Institute of Technology; H. D. Krummell, Socony-Vacuum Oil Co.; A. M. Lane, Vickers, Inc.; Cameron Lusty, Globe Corp.; Otto J. Maha, Hannifin Corp.; C. J. McLean, Public Service Company of Northern Illinois; H. L. Reynolds, Verson Allsteel Press Co.; Carl E. Schmitz, Crane Packing Co.; and Otmar E. Teichmann, Armour Research Foundation of Illinois Institute of Technology.

The attendance at the N.C.I. H. has increased each year.

Frank W. Edwards, director of civil engineering at Illinois Tech, is conference secretary, Technology Center, Chicago 16, Ill.



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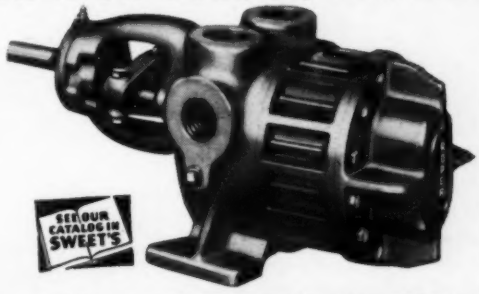
SECO CONTROL UNIT USES A ROPER PUMP FOR HIGH-VOLUME, LOW-PRESSURE OPERATION



● This Seco Fluid Power Package requires two pumps when hooked-up to a hydraulic press. The initial squeeze of the ram is supplied by a high-volume, low-pressure Roper Series F Pump — the final squeeze from a pump designed by Seco. The pumps operate intermittently, thereby making it possible for the Seco unit to operate two presses alternately.

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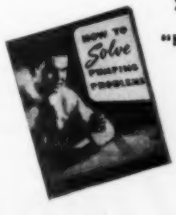

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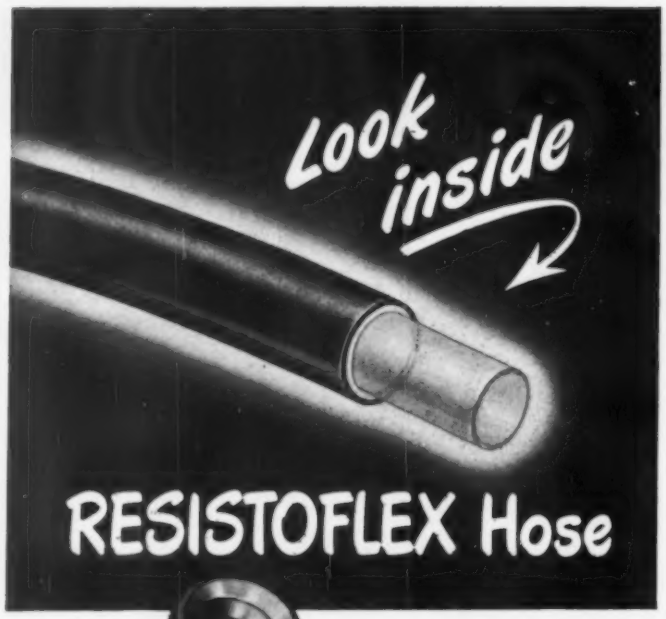

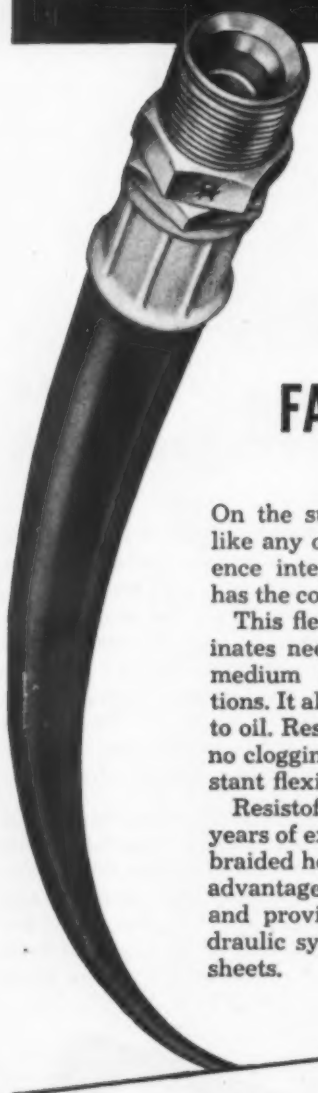

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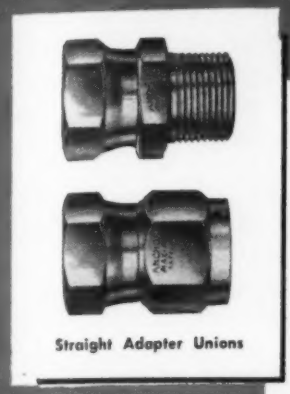
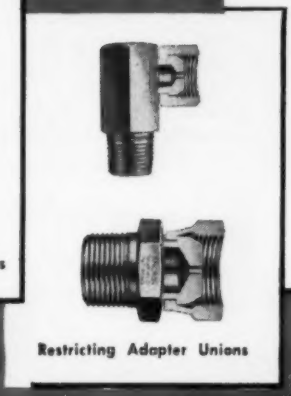
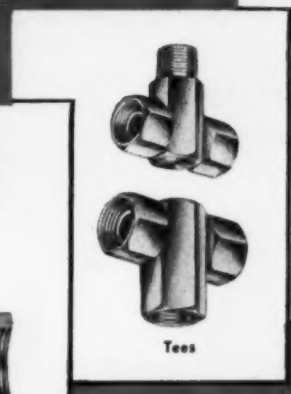


Straight Adapter Unions

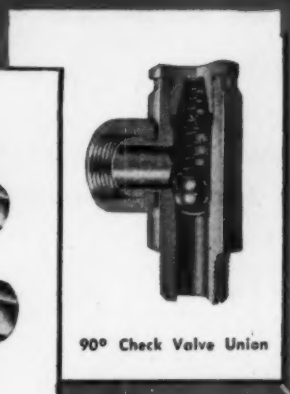
45° and 90° Adapter Unions



Restricting Adapter Unions



Tees



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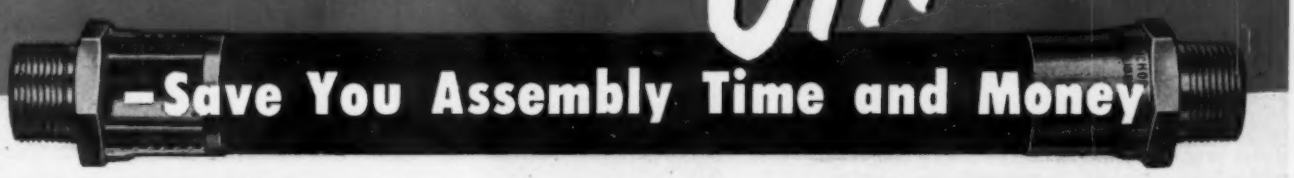

Anchor Ductile Sleeve Couplings assembled on two wire braid hose for high pressures.

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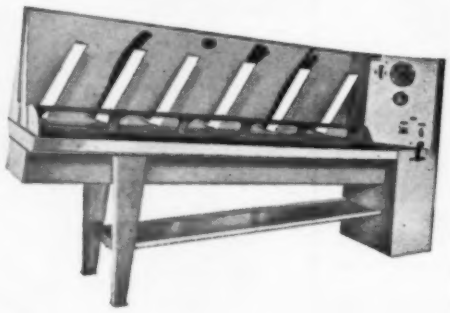

Model S-273 provides faster inspection to AN standards. Low in cost. Operates on 100 P.S.I. plant air supply. Explosion proof. Can be used with oil, water or corrosive fluids. For static testing of hose at any pressure — 200 to 25,000 P.S.I. Operator fully protected by plexiglas shield covering 10-ft long inclined sump. Users report testing twice as many hose in a given time as formerly.

SPRAGUE MODEL S-226 HYDRAULIC COMPONENT TEST MACHINE

Flow capacity 0-10 G.P.M. Variable volume pressures to 5000 P.S.I. Designed especially to meet the needs of component manufacturers, Model S-226 is excellent for testing valves, cylinders, hydraulic lines, etc. Other models with flow capacities to 40 G.P.M. and pressures to 5000 P.S.I. are available. Units may be equipped with Sprague Model 216 air operated boost pump to attain static pressures to 50,000 P.S.I.

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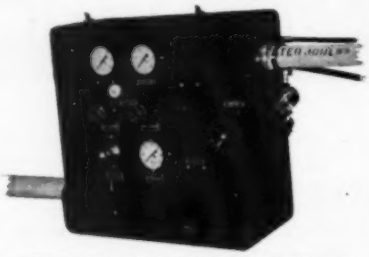

Measures 24"x24"x12". Weighs only 100 lbs.

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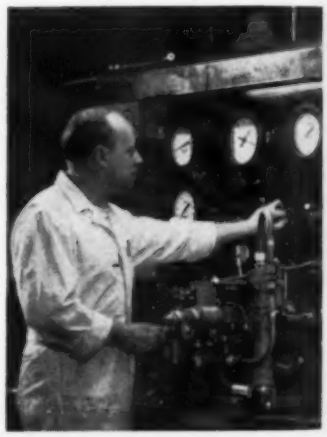
"First Be Sure—"

"FIRST BE SURE YOU ARE right, then go ahead" is more than a slogan at Northwest's Holman Field maintenance base in St. Paul, it is a standard procedure. A new $7,000 hydraulic test stand, used to test all hydraulic units including landing gear actuating cylinders, is being used to give a complete, accurate picture of how each unit operates on the aircraft under actual flying cnditions.

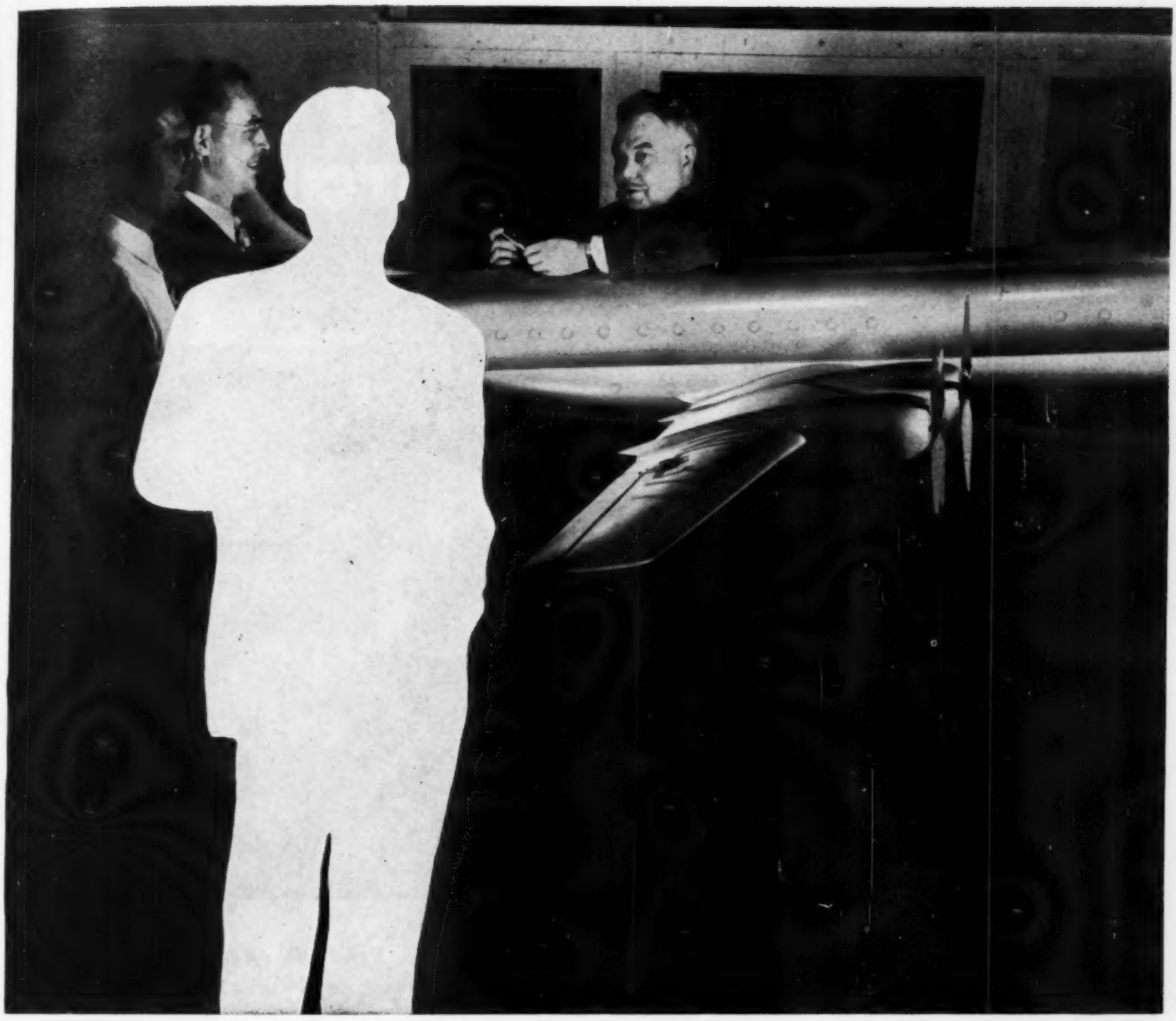
The test stand is equipped with a 16 gpm, 3000 psi pump, powered by a 30 hp motor.



The stand has nine gauges which register pressures from 0 to 25,000 psi, two flowmeters, two accumulators, four pressure manifolds and a selector valve, the latter for testing hydraulic cylinders. A hand pump is used for static pressure (leakage) tests. Test pressures range from 25 to 4500 psi.

More than 300 units on four types of planes—Boeing Stratocruisers, Martin 202's, DC-4s and DC-3s—are checked for leakage, pressure and drag.

The various tests require from five minutes, for a hydraulic pressure check valve—to three hours, for a cowl flap manifold assembly. An operational check for a hydraulic pressure regulator takes from one to two hours. All tests may be performed by a single mechanic. Complete testing of all hydraulic units on NWA's four-engined craft, the Stratocruisers and the DC-4s, requires four working days.



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Boeing's world-wide reputation for sound engineering achievement is founded on men. Boeing engineers and physicists are graduates of many universities and technical schools. They come from every state in the Union. Under inspiring leadership they have been welded into one of the most potent forces in any field of scientific advance.

If you can measure up to Boeing standards, there is an attractive future for you in this renowned group. In addition to the prestige which attaches to being a member of the Boeing engineering team, there are other definite advantages:

1 The challenge of working on such vital programs as the B-47 and B-52 jet bombers, guided missiles and other revolutionary developments.

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3 The invigorating atmosphere of the Pacific Northwest—hunting, fishing, sailing, skiing, temperate climate all year around.

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5 Good salaries. And they grow with you.

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Boeing's immediate needs call for experienced and junior aeronautical, mechanical, electrical, electronics, civil, acoustical and weights engineers for design and research; for servo-mechanism designers and analysts; and for physicists and mathematicians with advanced degrees.

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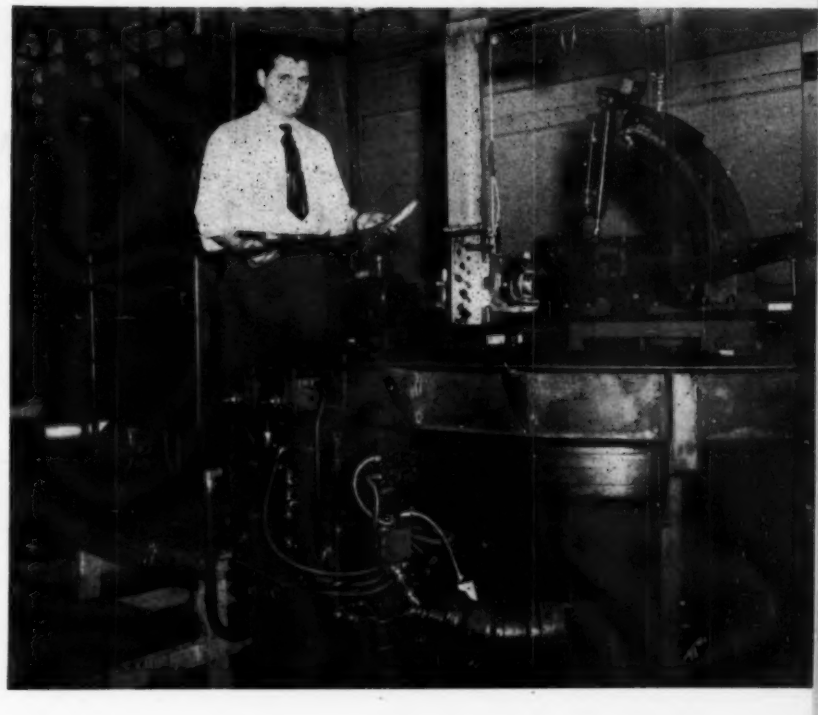


Tricky reverse bends having an elliptical cross-section are mass produced on this special bender. The fluid motor rotates the table through a gear reduction unit. Clamping of the part in the forming fixture is accomplished by air power.

Production Men Design GM's Benders

By RUSSELL SIMONSON

Standard forming machines just won't do the job of meeting GM's production. Ternstedt's production engineers built their own unusually versatile machines by careful selection of standard air and oil components.

FORMING REVERSE AND ELLIPTICAL BENDS offers an interesting tooling problem for parts requiring mass production. Ordinary press working tools will not do the job. Window moldings in automobiles, made from steel sheet stock call for the design of special forming machines which will maintain a high rate of production and will give rigidity as well as styling by contouring the stock into an elliptical cross-section as the molding is formed.

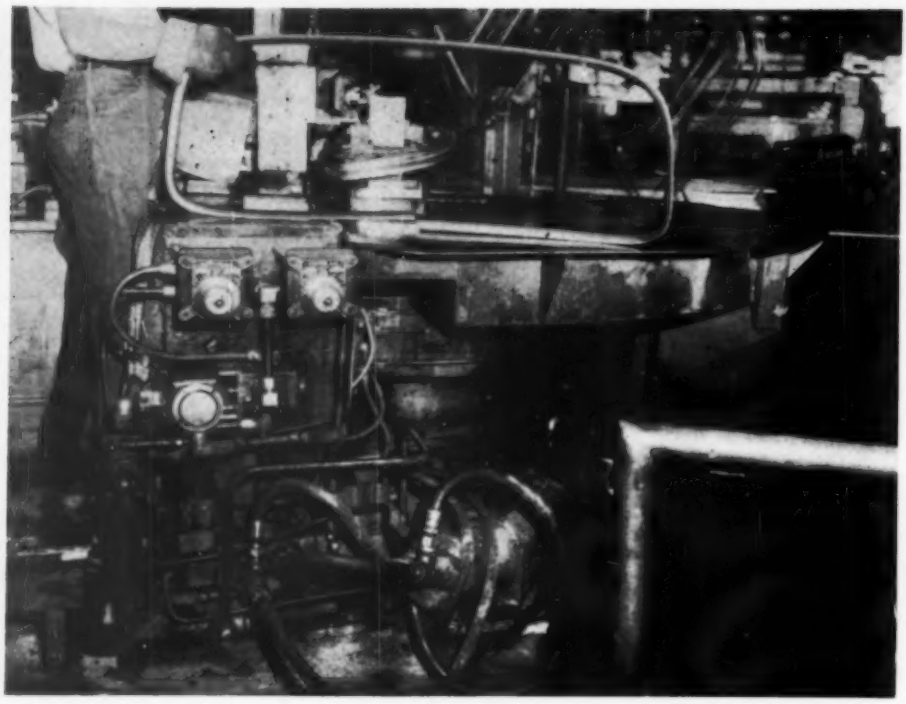
The Ternstedt Division of General Motors Corporation, Columbus Plant, produces many of the metal trim parts that are used in the GM line. Because of the many available body styles and models offered by GM, there is a variety of moldings having different shapes and sizes. Machine designers were confronted with the problem of developing a basic machine which could handle all the variations by simple adjustment of controls and the changing of a forming fixture. Similar to press working jobs, new fixtures or dies are required when yearly model changes are made, however, the basic machine is used with little or no modification. The final design of the bender has a large table which is rotated by hydraulic power. Mounted on the table is the forming fixture. The stock is clamped in the fixture and the wiping or forming tool is held against the stock by the action of an air cylinder.

As the table rotates, the fixture turns and the wiping arm forms the stock to the contour of the die.

Most of the parts, as seen in the photographs, have tricky corner bends which demand changing the speed of the rotating table to create a smooth wrinkle-free part. Such critical control is easily maintained with an oil system.

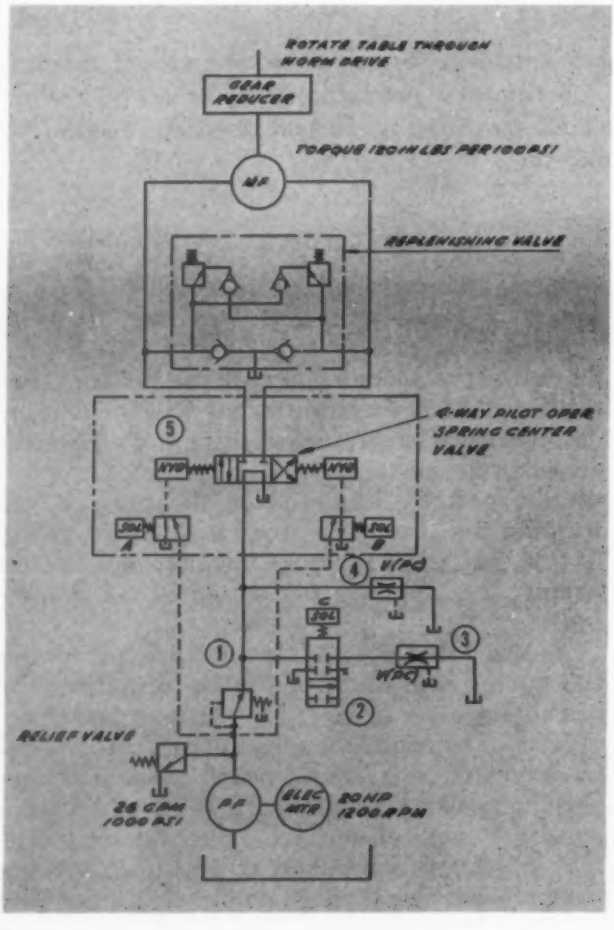
Operation is made completely automatic

Russell Simonson is Hydraulics Engineer at the Ternstedt Division of General Motors Corporation, Columbus Plant.



This window molding has just been removed from the fixture. Flow control valves are set to vary speed of forming to assure a perfect wrinkle-free part. Reduced forming speed is necessary at the corners. Electrical control permits automatic operation from load to unload.

Oil power is used to rotate the bending machine table. Speed control is provided by two bleed off flow control valves. One flow control valve is cut in and out of the circuit at the proper time by limit switch control of solenoid valve 2.



from load to unload by the use of limit switches and cammed valves to control the forming speed and unclamping of the part.

The air and oil systems have operated efficiently with a minimum of maintenance. On several of the benders where changes in the hydraulic system are made to give varying rotational speeds for different parts, the use of flexible hose has been advantageous.

Hydraulic Circuit To provide the slow speed and proper torque to the machine table, the high speed axial piston fluid motor must power the table through a gear reduction unit. There is no non-productive travel to the table. The stock is placed in the fixture and clamped; rotation is started, and at the sections where slower forming is needed, a cam trips a limit switch to energize solenoid C directing oil through flow control valve 3. A second limit switch is tripped to deenergize solenoid C for forming at the original speed of rotation as governed by valve 4. Table rotation stops when solenoid A is deeenergized, and the formed part is removed from the fixture. The table has rotated 360 degrees.

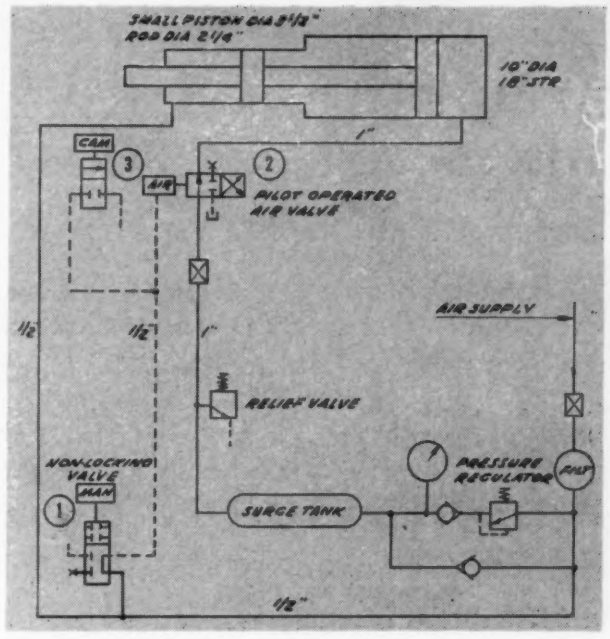
The directional control valve 5 for the rotary fluid motor is pilot operated, solenoid controlled. Pilot pressure is maintained by the sequence valve 1, which will not permit pressure oil to reach valve 5 until pilot pressure builds up and opens the sequence valve. Valve 2, a 4-way closed center valve operates as a 2-position, two way valve to put flow control valve 3, in and out of the circuit as determined by the actuation of solenoid C.

Should We Use Air or Oil?

On this application at Ternstedt, the engineers chose to use oil to move the table and air to power the fixture. What are some factors behind this choice?

Power and travel—the table movement requires a lot of power and accurate control of motion—oil best meets these needs. Action of the wiping tools on the fixture calls for speed. No feed control is necessary and the required force is developed by proper selection of cylinder size based on air supply pressure.

An important reason for supplying air to the fixture was convenience. Sufficient plant air capacity was available making it unnecessary to mount another power source. Also the use of oil to the fixture might have caused inconvenience due to leakage on the table.



Air Circuit

Shop air is used to actuate the forming fiixture. The air cylinder clamps the part and the wiping arm against the stock to form the part as the fixture rotates with the table. To actuate the cylinder, the operator moves the handle of non-locking valve 1 admitting air to the pilot port of valve 2. Pilot pressure opens valve 2 directing air from the main supply to the blank end of the cylinder. When the operator releases the lever of valve 1 all ports are blocked and pilot pressure is trapped holding valve 2 open. At the completion of forming, a cam on the rotating table opens shut-off valve 3, exhausting pilot pressure from valve 2. Valve 2 is then spring returned to shut-off air to the blank end. Air pressure on the rod end returns the cylinder.

At all times when the main air supply is open, there is air pressure on the small piston. On the forward stroke this pressure acts as a cushioning back pressure. On the return stroke, the double piston design, which presents a small area to return pressure, makes possible rapid traverse.

Use of the surge tank damps pulsations and assures constant pressure on the forming tool despite fluctuations in the main supply which may be caused by operation of other utilities throughout the plant. The check valves, mounted in parallel and series with the pressure regulator protects the regulator from any momentary back pressure from the surge tank, during actuation of valve 2.

Electrical Circuit Sequence of Operation

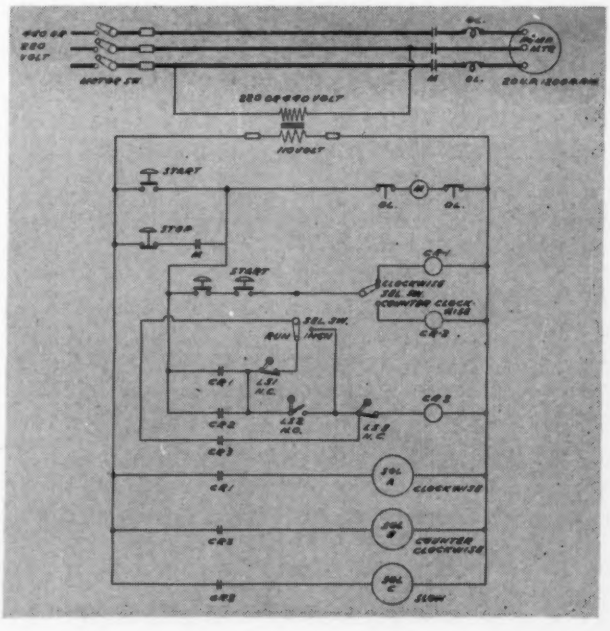
The start button is pressed to energize M starting the hydraulic pump motor. With the port loaded and clamped in the fixture, the two palm buttons are pressed to energize CR1 (sol A), turning the table fast to a point just ahead of a sharp bend.

Cam closes LS-2 to energize CR3 (sol C) to give slow feed. Table goes slow until limit switch 3 is contacted to deenergize sol C.

Fast and slow cycle can be repeated as often as required by the shape of the part.

At the end of rotation LS1 is opened to deenergize sol A and stop the table.

When the machine is wired to complete a part in 90 degrees of motion, the operator has a different set of palm buttons to reverse the table after unloading the part. Sol B is then used, directing oil to reverse rotation of the fluid motor.

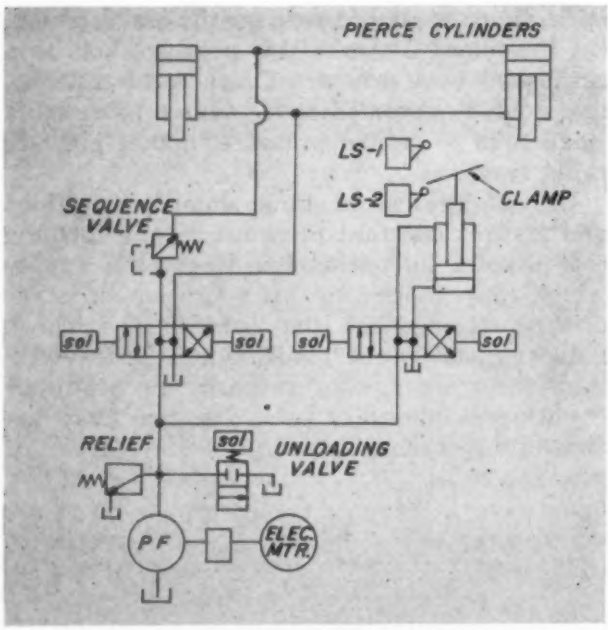


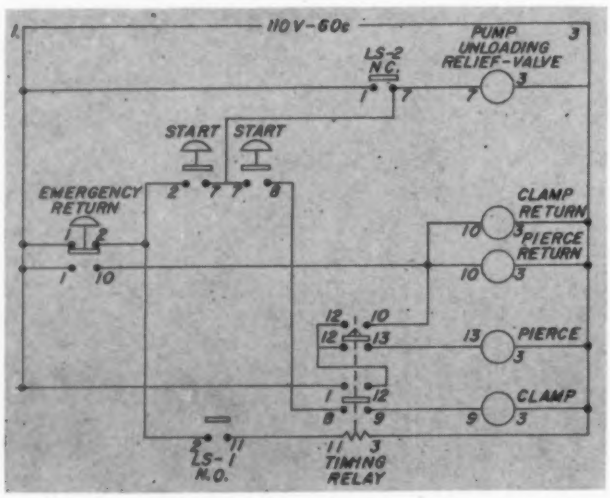
CIRCUIT HINTS

Second in a series giving suggestions on the use of electrical components to control hydraulic power. This month we . . .

Combine Limit Switch and Timer Control

By RUPERT P. ESSER





SAFE OPERATION OF ANY PIERCE OR CUTTING tool requires the work piece to be rigidly clamped while work is being done.

This piercing machine uses a clamp which is actuated by a small hydraulic cylinder. Limit switches, tripped by the movement of the clamp, properly sequence the cycle to make sure the pierce heads do not move before the work is fully clamped.

Pressing the first start button to close contacts 2-7 energizes the unloading valve solenoid, closing the valve to permit oil pressure to build up.

Pressing the second start button 7-8, energizes the clamp solenoid of the two positions, 4-way, double solenoid valve in the clamp circuit. As the clamp moves away from limit switch 2 this N.C. switch closes and when the clamp completes its travel to tightly hold the work. N.O. limit switch is closed.

Closing limit switch 1 energizes the timing relay and the forward pierce solenoid through contacts 1-12. The clamp solenoid is deenergized, but the clamp valve does not change position because it has no springs. The piercing tools move forward. The sequence valve maintains pressure on the clamp cylinder during the approach of the piercing cylinders.

After the work is pierced, the timer contacts 12-10 close to deenergize the pierce solenoids and energize the clamp return and pierce return solenoids. When the clamp is fully open, limit switch 2 is tripped open to deenergize the unloading valve and the pump unloads to tank at zero pressure completing the cycle.

Rupert P. Esser is chief engineer of TEC Engineering Corp. Logansport, Indiana.

The Rickel tricycle dump tractors are tested on the Rickel farm before shipment. The tractor may be driven from a seated or standing position, the latter giving exceptional visibility. The body and tail gate may be operated separately as shown.

The large body overhang makes dumping a low power tipping operation and aids materially in making short radius turns. Operating levers are within hand reach of the driver; pump and valves are easily accessible for maintenance.

This Little Tractor Went To Market

. . . farmer builds oil powered dump tractor

W. C. Rickel and his son Carl, farmers of Basehor, Kansas, have reversed the usual practice of going to the city for their tractor equipment. They build them and take them to the city. They are building a special tricycle hydraulic dump tractor which has won enthusiastic reception from leading Midwestern stock yards because of its ease of operation, its ability to turn in approximately its own length, to back without jack-knifing, low initial cost and unusually favorable operating and maintenance cost.

The 500 acre Rickel stock feeding farm is located about 20 miles west of Kansas City in Leavenworth County. They have fed approximately 1000 head of meat cattle. The farm is highly mechanized and, like many modern stock farms, has a well equipped work shop.

The introduction of DDT as an insect spray for cattle led to the idea of spraying cattle in the Kansas City Stock Yards, where many of the Rickel stock are shipped. After firmly proving their methods by use on their own stock, the Rickels applied for and obtained the concession for spraying stock in the Kansas City yards. The tricycle dump tractor grew out of the need for a simple, extremely maneuverable vehicle that would enable them to do their contract spraying efficiently.

In going from one pen to another in the stock yards to spray cattle, a 400 gallon sprayer, mounted on wheels, was towed by a tricycle tractor. It was necessary to go through narrow alleys, make sharp turns and back away from obstructions in close quarters, e.g., loading docks. The sprayer unit would often-jack-knife with the tractor. The next step was to place the sprayer unit on top of the tractor.

A further step was to build a flat bed over the tractor for such uses as hauling bales of hay to areas where trucks of less maneuverability could not go. The natural next step was to add sides and ends to the flat bed so that loose grain, sand, coal and manure, as well as baled hay, could be hauled and still go where trucks could not. Finally, the addition of the hydraulic dump bed gave a speed of unloading that matched the maneuverability.

The driver's seat tilts up so that the driver may either stand or sit while handling his load. The tractor has an overall length of 14 feet 8 inches; the bed of all welded steel construction is 11 feet 3 inches long and 6 feet 6 inches wide; the floor of the bed is 3 feet 7 inches from the ground. While a standard bed of 19 inches height is normally furnished, any height that will take care of any reasonable load has been furnished.

(Continued on page 64)

While oil has long been used for brute force applications, designers are fast becoming aware of the many possibilities offered by oil for the complete control of timing the operations of automatic machinery. Today, the advantages of hydraulic against electrical control must be weighed.

Valve Selection Simplifies Control

. . . for safe automatic staking and spinning

PILOT OPERATION OF DIRECTIONAL valves, selection of cam operated valves and the use of sequence and time-delay valves gives the designer a means of building a complete production machine without the use of solenoids, limit switches or electrical timers.

The use of oil for control is becoming more wide-spread as engineers and maintenance men become better acquainted with available valves.

The application of oil control to this staking and spinning machine illustrates the ingenuity of the hydraulic engineer in providing all the necessary operations.

This vertical press has two heads, each having a 5 inch bore and 5 inch stroke. One head is for spinning over a tie rod end on a steering mechanism and the second is for staking the spin over to firmly assemble the parts.

The designer had to provide for eight cycles per minute; the machine must cycle automatically and also a selector mechanism for semi-automatic operation with the machine stopping at the end of each cycle must be provided.

To facilitate loading and unloading of parts in the 12 station index table, both heads had to be fully retracted before the table indexes.

The combination of valving to meet these requirements results in an interesting circuit.

Valve 12 shown in normal run position is a safety device for emergency stop. When shifted to stop, pressure oil moves from P to B to pilot port J on the main valve 4. The spool of valve 4 is shifted to the position shown and the oil pressure unloads.

Valve 13 is a selector valve for automatic or semi-automatic operation. If this valve is latched in the start position the press will cycle continuously. For one cycle operation only, the valve is momentarily shifted to start position to start the cycle and then released. The press will

CONTROL METHODS FOR THE DESIGN ENGINEER

Operation of this staking machine shows where oil control is practical and offers important advantages. Panel mounting of valves centralizes the controls and pilot operation makes unnecessary the use of an electrical control station.

Timing and sequencing of operations to obtain the most productive cycle is an important design step. The choice between electrical components to actuate hydraulic movements or full hydraulic control as used on this staking and spinning machine, is primarily determined by the required accuracy and dependability of control.

Hydraulic sequence valves and time delay valves have variable characteristics. They are affected by oil temperature, pressure surges and oil flow. The action of their operating spring is subject to variations due to wear, fatigue and any foreign matter in the system.

Variables affecting hydraulic control point to the use of electrical components where extreme accuracy is required. Further, the use of solenoids, limit switches and electrical timers offers flexibility for changing the cycle of operation.

go through one cycle and stop.

With the press idle and valve 12 in run position, valve 13 in stop position, all valves are in positions as shown on the drawing.

Pump supply is directed to port P of valve 4 and out port A back to tank. The size of return is reduced to create sufficient back pressure to operate pilot valves. Pump supply is also directed to port P of valve 12 and out port A to port P of valve 13 and out A to port P of valve 1 and back to tank.

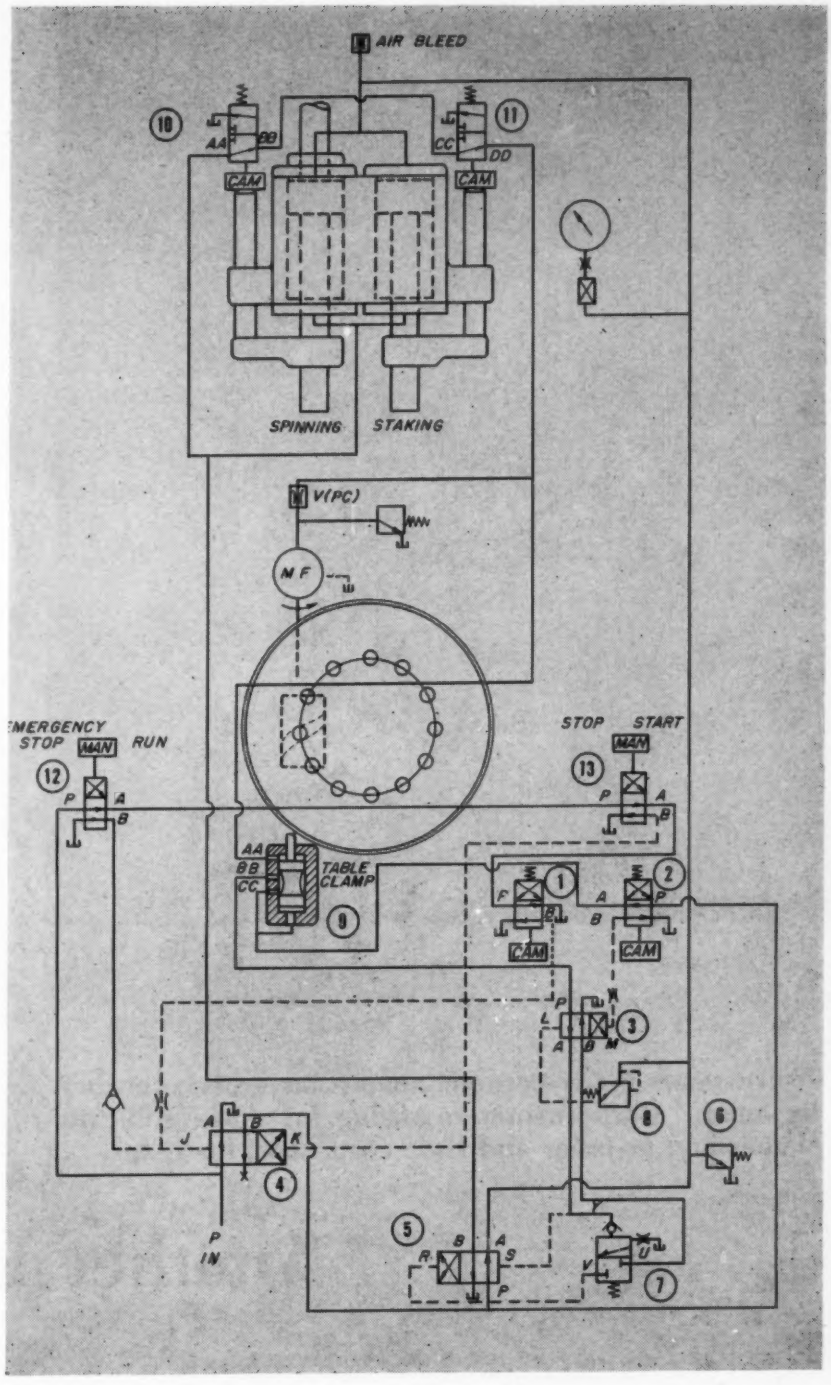
Semi-automatic Operation

For one cycle operation of the machine, handle of valve 13 is momentarily shifted to start position directing pump supply out port B to pilot chamber K of valve 4. Piston of valve 4 moves to left, directing pump supply through port B to port P of valve 5. Valve piston 5 being in position shown, pressure is now directed to top of ram cylinders for their down stroke at pressure governed by relief valve 6.

Pressure is also directed to port P of valve 2 and out port A to port CC of lock plunger 9, to hold the plunger in place. Oil goes out port BB of 9 into port P of 3 and out port A to ports S and Y of valves 5 and 7. Both rams advance and at end of the down stroke, pressure buildup in the line opens sequence valve 8 directing pilot pressure to port L of valve 3.

Piston of valve 3 moves to right exhausting S and Y of valves 5 and 7 and directs pressure from port P through port B to port U of valve 7.

After the adjustable time delay of valve 7 expires, port U is opened to port V and pilot pressure is applied to R of valve 5, shifting the piston to the right. Pump supply is



now directed through B of 5 to lower side of ram cylinders and to in port AA of valve 10. Both rams return and at the end of upstroke, valves 10 and 11 are depressed to the position shown. Pressure at AA of 10 is now directed through BB to CC of 11 and out port DD to the fluid motor and to port AA of valve 9.

Lock plunger is withdrawn and fluid motor now rotates index cam and cam shaft carrying operating cams for valves 1 and 2. The table indexes and release of the piston in valve 2 connects pressure port P to out port B to pilot chamber M of valve 3, shifting piston of valve 3 to the left to position shown. Port P of valve 3, however, has no pressure as it is supplied from port BB of valve 9 which is blocked when lock plunger is retracted.

The cam momentarily

(Continued on page 65)

Data courtesy of Logansport Machine Co.

As the lower platen moves up to mold another piece, a completed shape is loaded on the rollaway truck. The compact hydraulic power system is located at a remote point leaving a clear work area. By pressing a push button the operator is controlling the motion of the movable platen.

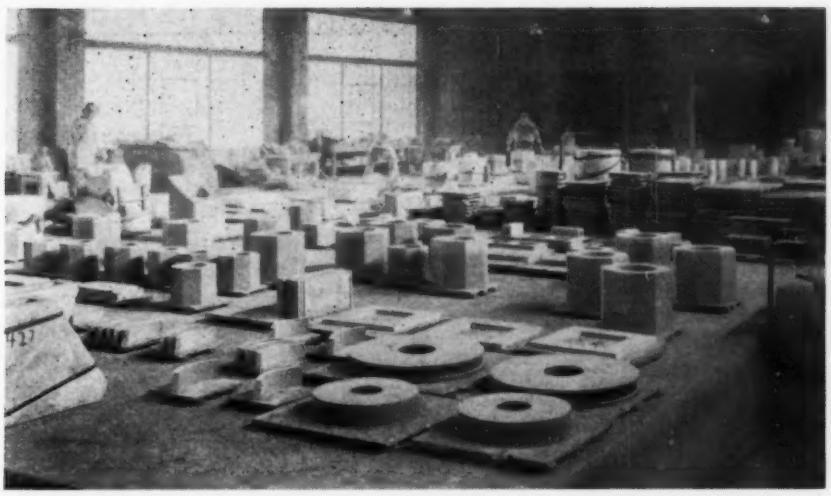
For years many ceramic shapes have been formed by hand. With customers asking for more intricate shapes and as labor and time costs soar, for help . . .

Another Industry Turns t dy

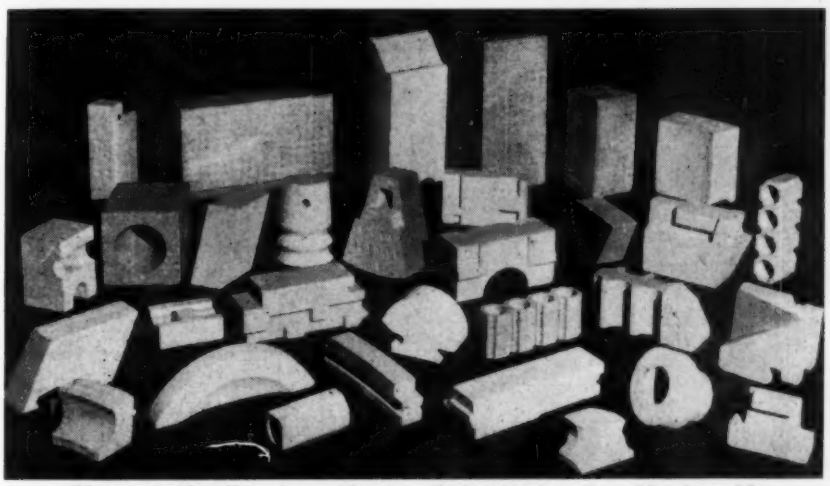
HYDRAULICS IS FINDING A DEFINITE PLACE IN the manufacture of clay products. Demands from other industries for a variety of shapes in varying quantities to meet the requirements of new applications, have caused the rapidly progressing ceramic industry to investigate automatic production methods.

An example of what hydraulics can do to broaden the scope of production is evidenced in the manufacture of special refractory shapes and graphite products such as arch tile, checkers, taphole blocks, burner blocks and crucibles. These specialties, a few of which are shown in the photographs, are not all readily adaptable to the usual production methods such as extrusion, spinning and repressing. Hand molding of these wares generally involves filling and packing a suitable mold, tamping in wads of clay one after the other until a complete piece is formed. Such a production process can be studied by considering the net results:

1. Hand packing and tamping results in nonuniformity of structure of the material, a nonhomogeneous body.
2. In order to hand mold, the clay must have sufficient plasticity so that it can be worked. This means high water content.
3. The water introduced to provide proper plasticity must later be removed by drying before the ware can be fired.
4. Due to the required plasticity, hand formed



Hydraulic forming makes possible the economical production of many shapes which have been considered "special". The representative shapes shown here indicate the versatility of press forming.



Hand molded shapes have been laid out to dry on this large drying floor. Had hydraulic pressure been used to form these large shapes, drying time would be reduced or eliminated, giving savings in space and valuable manhours.

Photographs Courtesy Mexico Refractories Co., Mexico, Mo.

s to Hydraulic Power

ware is easily distorted and not always true to size and shape. The pieces cannot be stacked because of deformation due to weight. Rejects are high..

5. The process is slow and therefore costly.

6. Since the process is slow, orders for some shapes are restricted to small quantities because they can't be filled within a reasonable time.

7. Some specialties are entirely avoided because of difficulties involved with hand molding.

The use of an hydraulic press, combined with the proper design of dies to be used with the press, has so completely overcome the difficulties of hand molding that a specialty department actually pays dividends. Thus, point for point, hydraulics has provided the following advantages:

1. Uniform density and homogeneity with proper grain orientation to increase resistance to slag erosion and abrasion.

2. With large forming force available, clay can be stiffer which means less water.

3. Due to less water, drying time is not only shortened, but sometimes entirely eliminated, with the ware being placed directly into the kiln for firing.

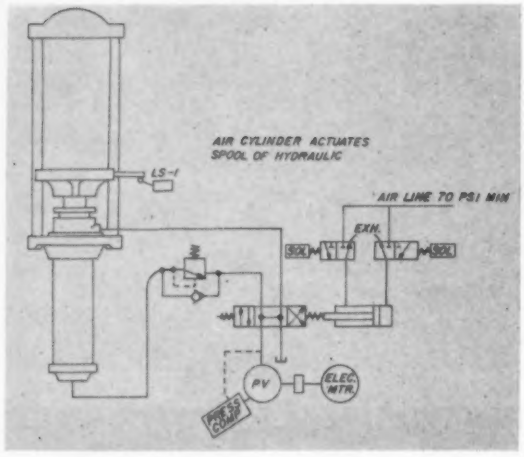
4. Further, because of low water content, the ware is true to size and shape and even in the "green" state is rigid, preventing distortion in handling and stacking on drier cars. Rejects are greatly reduced or even eliminated.

5. High speed production at low cost is obtainable; users report greater than tenfold increases over hand molding.

6. Due to high production speed and consistently good quality of product, many manufacturers have greatly increased the sale of a given item. Special shapes are now profitable.

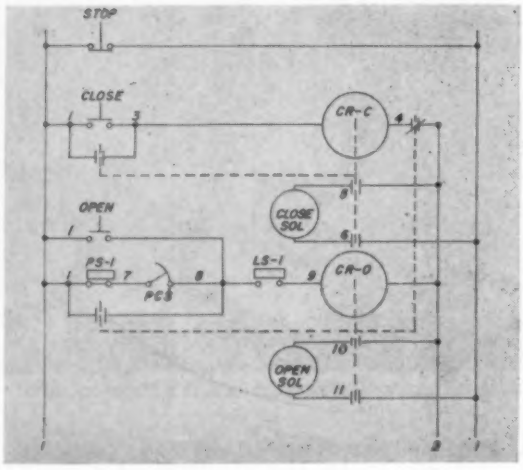
7. In plants now using oil power, the versatility of hydraulic pressing becomes increasingly familiar. Shapes which heretofore had not been made, are being successfully produced at fractional cost.

Oil and Electrical Circuits on Next Page . . .



Hydraulic System—The 3000 psi hydraulic circuit uses a basic 4-way, open center main operating valve and a counterbalance valve to prevent free fall of the press platen. The system is so designed that, through the use of a pressure compensated variable displacement pump, no power is wasted. Oil does not blow through a relief valve when under full pressure, and by virtue of the open center valve, oil is circulated at zero pressure between cycles. Press tonnage and operating speed can be easily adjusted to suit forming requirements. The completely packaged pumping unit reduces installation to merely setting on the foundation, running two pipes to the press, and wiring up.

Presses of the type shown here have run one or two shifts a day for upwards of five years without even so much as a packing replacement.

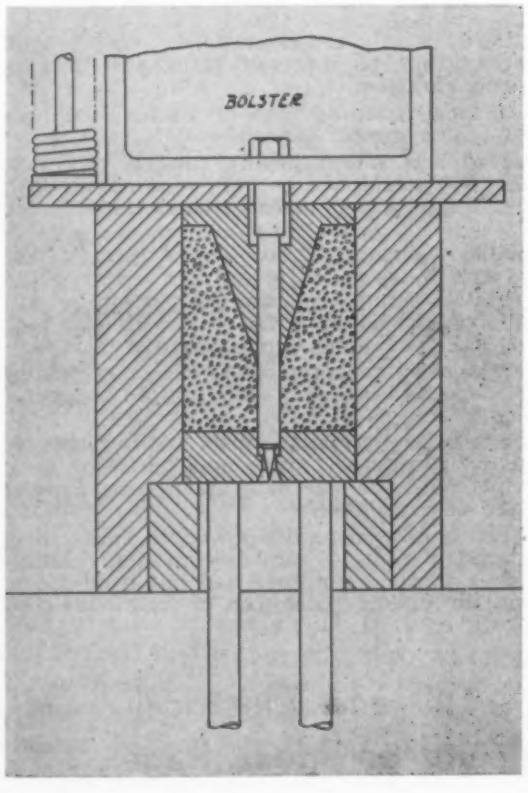


Control Circuit—Operation of the press is semi-automatic and is controlled by means of a "Close" push button. Momentarily contacting this button causes the press to close and form the ware. At a preset tonnage, pressure switch PS-1 closes to energize relay CR-O and deenergize CR-C causing the press to open and simultaneously eject the formed ware. When the movable platen bottoms, limit switch LS-1 opens to deenergize the circuit and end the cycle.

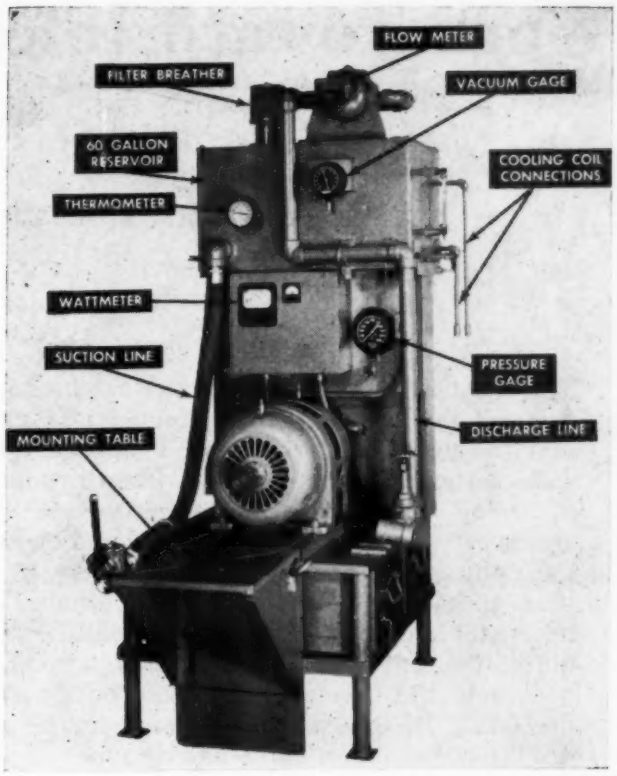
An "Open" button is provided for complete manual control and offers extra flexibility for setting dies. A "Stop" button allows the operator to instantly stop the press at any point of its cycle, after which contact of the "Close" or "Open" button resumes desired motion.

When pressure control switch, PSC, is open the press will not open automatically. This permits pressure dwell if desired, and allows pressure adjustments to be made and determined on the pump pressure gage.

Pilot operation of the main hydraulic valve is through compressed air at 70 to 100 psi, controlled by means of two solenoid operated air valves which actuate a stroking and self-centering device for the hydraulic valve. Compressed air was chosen for pilot operation because it is available in any plant and is inexpensive since only a small quantity is used each cycle. Further, the oil valve spool diameter is too large for satisfactory direct solenoid actuation and it was felt that pilot operated, solenoid-controlled construction would not be rugged enough. Air cylinder actuation is simple and has proven very dependable.



Die Design—Still a new technique to the ceramic industry, successful application of hydraulic power depends on the design of the dies. The adaptability of the press readily permits experimentation with the clay composition as well as with the tooling. In the closed position, the clay has been compressed to the shape of the die parts. Note that the center hole is made by the combined piercing and squeezing action of the center punch. When the press opens, springs strip the ware from the upper form and a spring operated ejector lifts the ware from the bottom die.



"It requires ten hours to locate trouble in the hydraulic system and ten minutes to repair it." If the tone of the griping your maintenance men are doing has reached this pitch, it's time you set-up an efficient test bench. You will want to build a stand which is flexible enough to handle pumps and valves in a wide range of sizes. It will not only pay you dividends in reduced maintenance costs, the test stand will help design and tool engineers select the proper components.

Test Stands Earn Profits

By S. J. KILLA

WHEN WE PLANNED OUR TEST BENCH, OUR main purpose was to provide means for checking pump efficiency, analyzing pump settings and also to "run in" pumps. We set about to design a stand which would be used chiefly for these purposes; keeping in mind that we would also use the stand for checking valves, cylinders, motors and even entire systems.

The photograph shows our design, built of welded steel plate construction. The prime mover of the test bench is a 15 hp electric motor mounted on rails to provide sufficient adjustment for attaching any pump in service at this time. The pump support bracket is slotted so that many sizes of pumps may be attached.

We mounted the reservoir on top of the test bench to insure a good head of oil on the pump inlet connection. The capacity of the reservoir is sufficient to contain a barrel of hydraulic fluid.

This test bench has afforded an excellent means for testing various hydraulic fluids both flammable and inflammable. A cooling coil was incorporated within the reservoir and the effects of temperature—resultant viscosity, etc. on the pumps are quite remarkable when controlled in this manner.

An immersion type dial thermometer is located on the reservoir along with a glass liquid level gage. The cover of the reservoir contains a filler cap, a filter type air breather, a clean out hatch and a return line connection. A fluid meter which indicates gallons pumped is placed on top of the reservoir cover. With the aid of a stop watch the fluid meter makes it possible to check the pump delivery in gallons per minute.

To diagnose such problems as pump noise we provided a connection in the suction line for a vacuum gage. Vacuum readings are taken while the pump is working at various fluid temperatures. Too high a vacuum on the pump inlet line will cause pump noise. The high vacuum is found to be due to operating with too high a viscosity fluid or at too low a tem-

(Concluded on page 57)

S. J. Killa is Hydraulic Maintenance Supervisor with The Ladish Co., Cudahy, Wisconsin

Work Toward Integrated Design To Simplify Your Circuits

By STANLEY A. JACQUES

HYDRAULIC UNITS PRESENT THE PROBLEM OF oil connections, and oil connections present the problem of possible oil leakage. The more individual items or units which are added to an oil circuit, the more connections are necessary. In a complicated hydraulic circuit there invariably are many individual units. If these units are present a repeated number of times, the next logical step is to combine the units into one hydraulic enclosed assembly with only the necessary inlet and outlet connections. In line with this reasoning a hydraulic combination valve has been developed to include the various manual and automatic components necessary for a hydraulic control system.

The hydraulic manual-automatic combination valve has been designed to mount on the outlet side of a jet-type regulator or to mount on a base independent of the regulator. This valve includes all the normal units that are necessary in a control system between the regulator and the cylinder of the controlled unit.

Figures 1 and 2 show actual installations of control systems mounted behind panel boards. These two control installations have similar specifications and regulate furnaces in steel plants. Figure 1 shows the installation of regulators with the new type combination valve having only the necessary inlet and outlet connections. Figure 2 shows the amount of connections and tubing replaced by the new valve.

The regulator at the right in Figure 2 is a ratio regulator with a transfer valve on the regulator, a manual-auto valve (behind the table and not visible) and a solenoid valve to remotely control the transfer valve. The second regulator from the right is a furnace pressure regulator with a booster mounted on the front end, a transfer valve mounted on the table, and a manual-auto valve (behind the table and not visible). The new valves in Figure 1 include these units within the valves and have only 3 connections in place of the 22 connections at each regulator in Figure 2.

A study of Figures 1 and 2 will show the great advantage of integrated design in accessibility for service of the control equipment and availability for installation and service of other equipment, such as instruments, gauges, etc. Hydraulic connections are reduced to a minimum and are easily accessible for tightening if necessary. Service to equipment is improved due to the easy accessibility of parts.

Fig. 1. Fewer piping connections are the result of combining a number of valves into one unit. This hydraulic system provides control for combustion and furnace pressure in a steel mill.

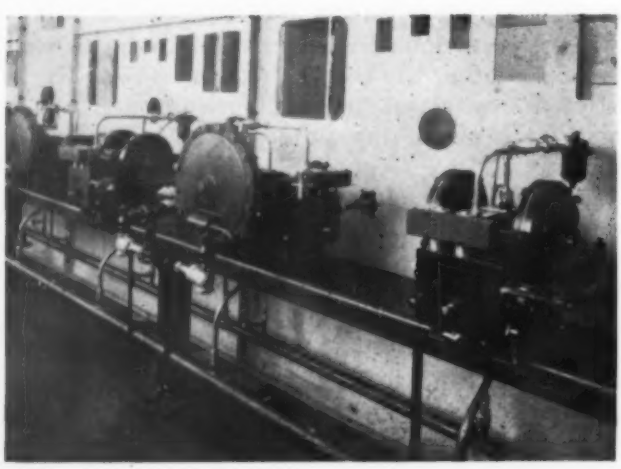
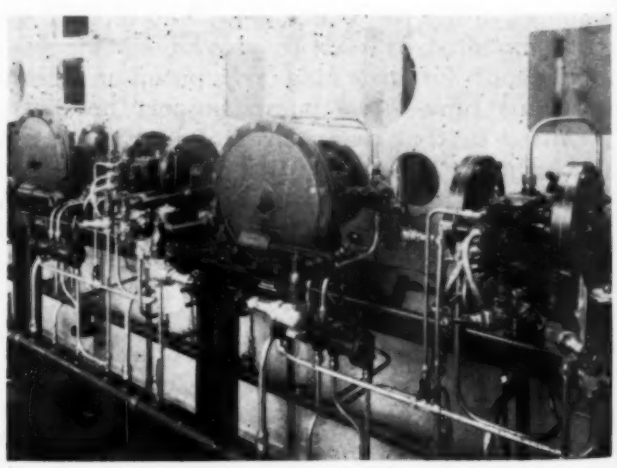
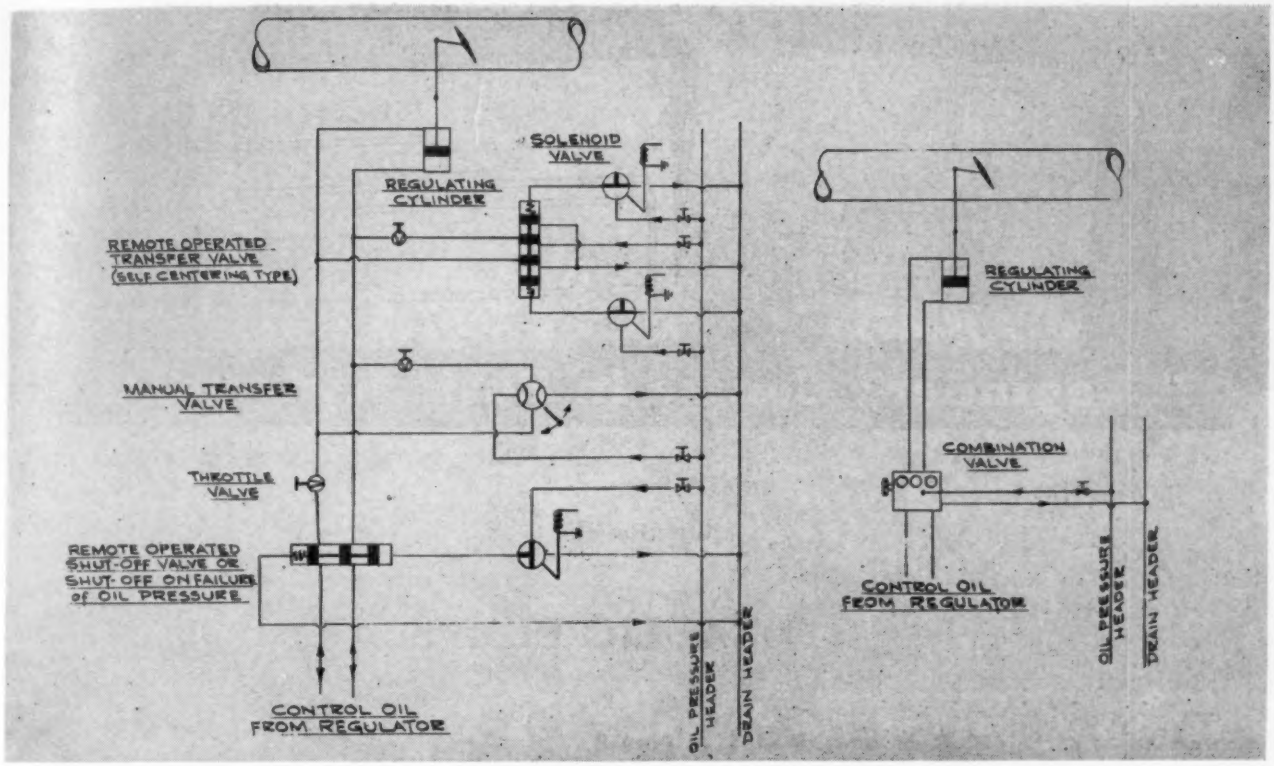


Fig. 2. This maze of valves and connections does the same jobs as the much simpler system in Figure 1. Using integrated design has resulted in quicker installation and easier maintenance.



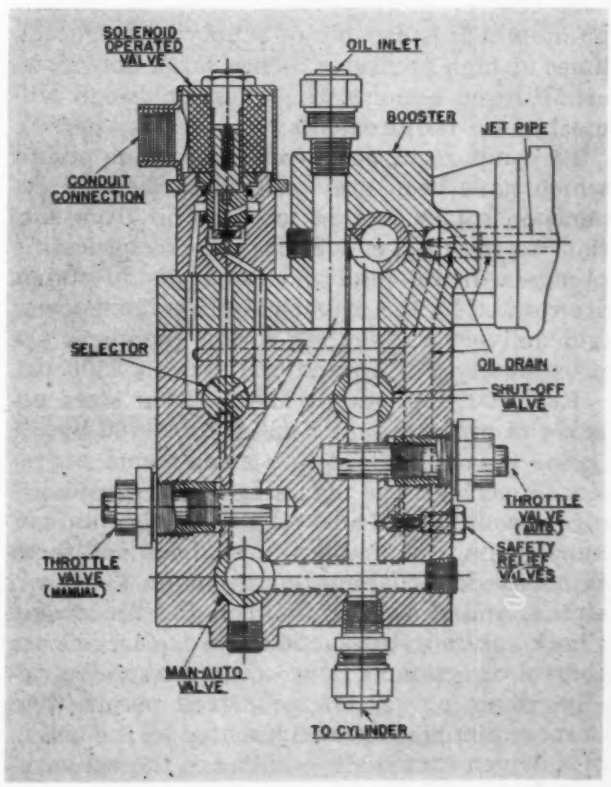


The circuit on the left shows the normal amount of equipment for remote and local manual control in a hydraulic regulating circuit for furnace pressure or combustion control. On the right is shown the same control in a combination valve. In this type of circuit, the control oil from the regulator automatically operates the regulating cylinder with the remote and local manual controls out of the circuit. If it is desired to operate the regulating cylinder manually, the shut-off valve, operated by a solenoid, shuts off the regulator circuit and permits the local and remote circuits to be operated. The local manual transfer valve is a four-way valve operated by a handle locally.

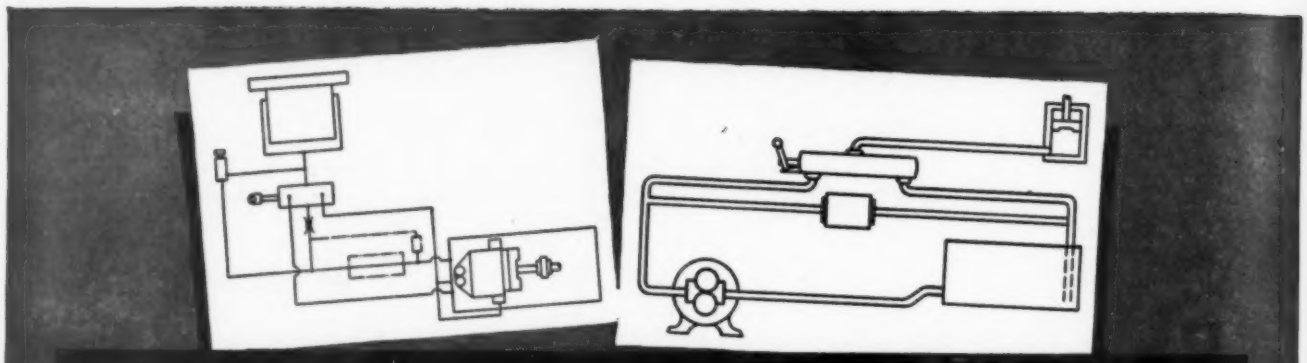
The remote operated transfer valve operates the regulating cylinder remotely with push buttons or other types of electrical switches. Throttle valves in each circuit permit control of the speed of the regulating cylinder. Upon failure of oil pressure, the shut-off valve automatically shuts off the control oil circuit and holds the regulating cylinder in its last position.

Integrated design for this control system results in a valve combining nine separate functions. The large oil lines supply full oil flow to the controlled unit and small oil lines supply pilot flow to pistons within the unit. The valve has one oil inlet connection for oil supply to manual and booster, and two outlet connections to the controlled unit, a total of three connections.

The combination valve consists of two parts: a body common to all assemblies and a head unit that can be either a distributor block or a booster. The distributor block receives the oil directly from the jet and distributes the flow to two lines through the valve to the controlled unit. The booster receives oil from the jet, this oil operates a pilot valve which in turn transfers a larger flow of oil to either of the two auto-lines in the valve in direct proportion the jet flow. The combination valve is designed to take this larger flow of oil through the valve with no turns and thus with a minimum pressure drop.



Stanley A. Jacques is Chief Designer, Askania Regulator Company, Chicago, Illinois



A Beginner's Course in Basic Hydraulics

Chapter VIII

HYDRAULIC PUMPS

Part 8

Reciprocating Pumps

CENTRAL HYDRAULIC POWER SYSTEMS ARE used in industries where a battery of oil powered presses or machines are being operated. For many molding and extrusion press installations, a central system is preferred over the use of a separate power unit for each press.

A central power system often requires a pump which is capable of supplying large volumes at high pressures, hence large horsepower. Rugged reciprocating plunger design will meet these requirements.

By comparison, gear, vane, and piston pumps which have been previously described all depend on rotary motion to carry oil from suction to discharge. Even the reciprocating plungers in the axial and radial piston pumps are rotated by the drive shaft. Top horsepower and delivery ratings for rotary pumps is approximately 275 hp and 175 gpm at 2500 psi.

Reciprocating pumps are built in sizes capable of pressures to 15,000 psi and 700 hp.

The principle of reciprocating pump operation is perhaps the oldest and most simple of all pumping methods. In a single plunger hand pump, the plunger moves back and forth in a cylinder, pushing liquid out on the down stroke, and drawing oil in on the up stroke. Check valves in the suction and discharge lines control direction of flow. On modern electrically, steam or gas engine driven pumps, two or more plungers are reciprocated by the action of a driven cam shaft—similar to the action in an automotive reciprocating engine.

Vertical or horizontal plunger pumps are built in simplex, duplex, triplex and multiplex models. The multiplication of cylinders increases delivery and where there is an odd number of plungers, pulsation is decreased.

Figures 1 and 2, show the Aldrich-Groff, controllable capacity "Powr-Savr" pump. This is a vertical triplex pump arranged so that each plunger operates one third of a cycle apart from the other two, so that no two are ever at the end of a stroke together. Pulsation is minimized by this arrangement.

Using a constant speed drive and fixed stroke pump, oil delivery is constant and any excess must be bypassed and power losses accepted. To eliminate these power losses and provide a pump which will deliver varying volume to meet system demands, one of three things may be done:

a. use a variable speed drive
b. operate intermittently
c. vary the plunger stroke.

Varying the plunger stroke is perhaps the most practical approach, and this may be accomplished in several ways.

Figure 2 shows the stroke adjustment device on the "Powr-Savr". This simple mechanism changes the pump stroke to deliver from zero to maximum rated capacity at constant pump speed.

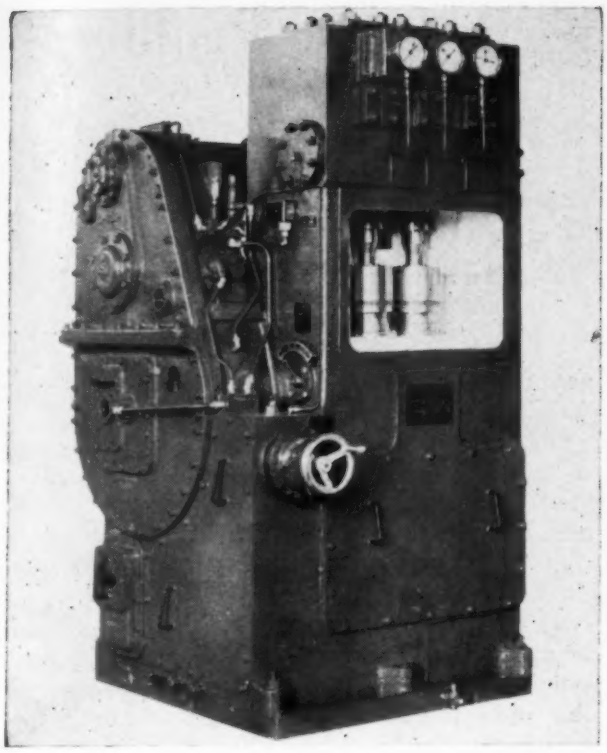


Fig. 1. This vertical triplex, reciprocating plunger pump, for pressures from 250 to 15,000 psi, is widely used for central hydraulic systems powering molding and extrusion presses.

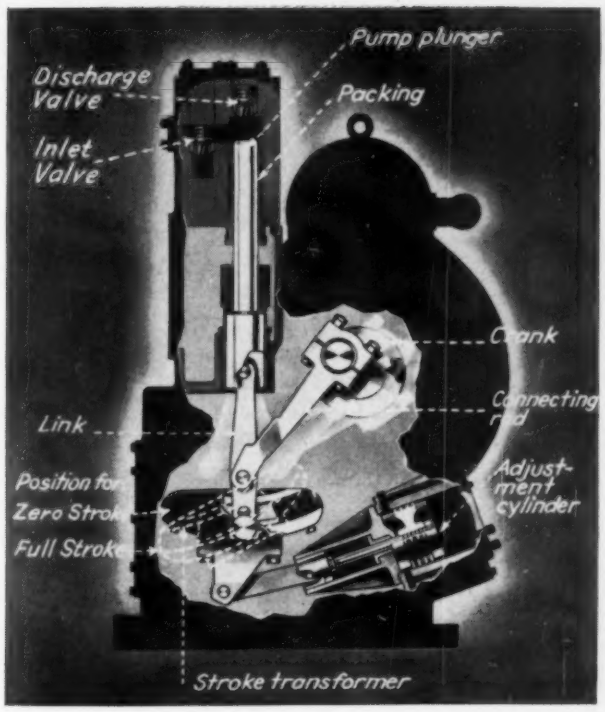


Fig. 2. Break-away illustration of the stroke transformer and adjacent parts on the Aldrich-Groff pump. The plunger stroke is varied to obtain delivery from zero to maximum. The stroke transformer is trunnion mounted so that it may be tilted to vary the stroke.

The stroke transformer, a 3-tracked curved guiding surface is mounted on trunnions so that it may be tilted to vary piston stroke. Positioning of the stroke transformer is done by the action of the adjustment cylinder which is powered by oil from a built-in lubricating pump. Movement of the adjustment cylinder may be controlled manually by the handwheel seen on the front of the pump, Figure 1, or automatically by suitable pilot controls.

Reciprocating plunger pumps can be made to handle many different fluids, consequently they are widely used as boiler feed pumps and for many processing applications in the food and chemical industries, as well as for industrial hydraulic systems.

Next month, part 9 will discuss combination pumps.

For Your Book Shelf

Principles and Methods of Telemetering

By **Perry A. Borden** and **Gustave M. Thynell**; *230 pages, published by Reinhold Publishing Corporation at $5.50.*

The art of telemetering, the "reproducing at a convenient location measurements made at a remote point", has developed rapidly in the past few years. An effort is made to present the essentials of such equipment from a consistent point of view and in perspective of past developments. Survey in treatment, the authors have had the advantage of cooperation of a number of makers of telemetering instruments and installations.

The logical plan, covering principles of current, voltage, frequency, position and impulse systems, is easily followed. There are sections on coordinating, totalizing, computing and integrating and on the selection and application of telemetering systems. The Appendix has a section on fluid (hydraulic and pneumatic) telemetering; a check list of major patents and a selected bibliography are useful.

Fluid Power Solves "Nip" Pressure Problem

. . . assures quick, uniform adjustment

AN ALL HYDRAULIC COMBINATION HIDE WRINGer installed in the A. F. Gallun & Sons Corporation tannery in Milwaukee has many advantages over the mechanical machines. Production has been increased by greater and more uniform removal of moisture; the ease with which the machine may be adjusted to a wide variety of pressures has made feeding of hides easier and safer for the operator; the simpler design of the machine has resulted in reduced maintenance.

Fig. 1. The operator places the hide on the lower roll prepatory to closing the rolls.

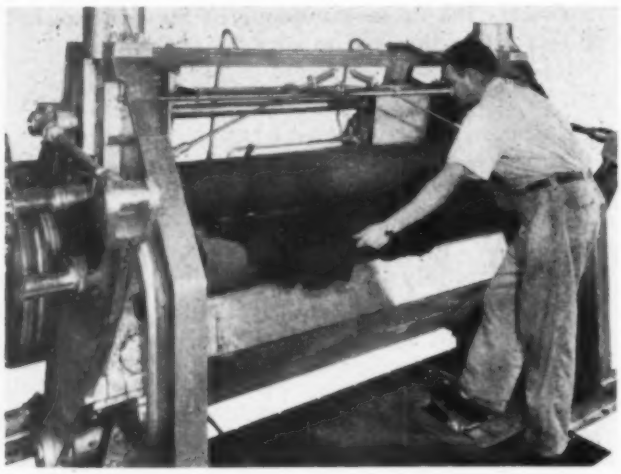
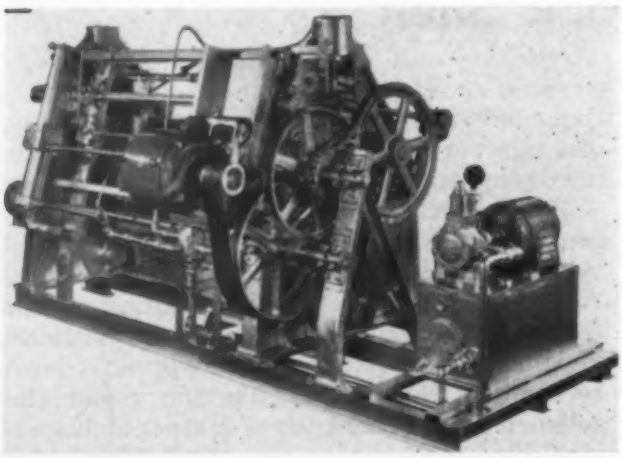


Fig. 2. The rear of the machine showing the hydraulic pump at the right, the valves, rear and top cylinders.



Photos Courtesy the manufacturer, Chas. H. Stehling Co.

Mechanical wringers for hides have been standard in the tanning industry for many years. A clutch and brake were used to connect and disconnect power for the work operation. Heavy pressure roll springs were used. Since the adjustments of spring tension at the ends of a relatively long set of rolls (standard lengths are 6, 7 and 8 feet) was a long, difficult job for two men, the general maintenance of the mechanical machine was a costly procedure.

The wringer is used after a tanning operation, the purpose is to remove most of the moisture.

Hydraulic operation eliminated the clutch and brake of the mechanical machine. Hydraulic cylinders replaced springs and spring rods and not only are capable of exerting a considerably greater pressure than possible with springs but they exert this pressure uniformly throughout the roll regardless of hide irregularities. Where considerable varieties in pressures are required, e.g., changing from calf hides to bull hides or vice versa, such variations are easily obtained by turning a set screw on the pump which is separately mounted on its reservoir at the side of the machine.

A large motor (15 hp), mounted on the back of the main machine frame drives the feed rolls through a combination of multiple V-belt, gear and chain drives. A smaller 5 hp motor mounted on the reservoir drives the variable volume radial vane pump through a coupling.

The hydraulic circuit controls two distinct operations. First it opens and closes the rolls by moving the lower roll forward toward the operator (opening the rolls) and back, under and against the upper roll (closing the rolls). This is accomplished by the operation of double acting hydraulic cylinders. A four way balanced piston valve is lever operated through a toggle arrangement by a foot treadle. The closing operation may be reversed at any point by operation of the treadle. In the previously used mechanical clutch, the cycle of closing had to be completed before the machine could be opened. In addition, the open position has

(Concluded on page 56)

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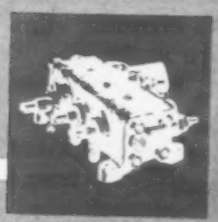

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FREE BOOKLET

RALPH E. MIDDLETON
Advisory Editor

Specifications have been developed to guide the designers of environmental test facilities. The types of environmental malfunction found in aircraft hydro-mechanical and electro-hydraulic units usually result from differential expansion, ice accretion, trapped moisture, inadequate surface protection, cavitation, grit or high oil and grease viscosity.

Environmental Testing of Aircraft Hydraulic Systems

By FRANKLYN B. COLE, JR.

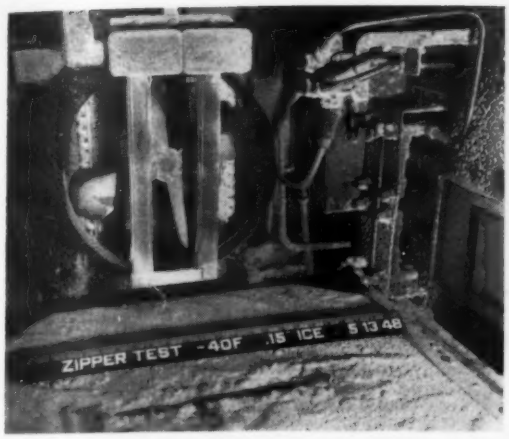
MODERN AIRCRAFT, MILITARY AND COMMERCIAL alike, is becoming more and more complex as the demands for greater speed, altitude, comfort and all-weather utilization are increasing.

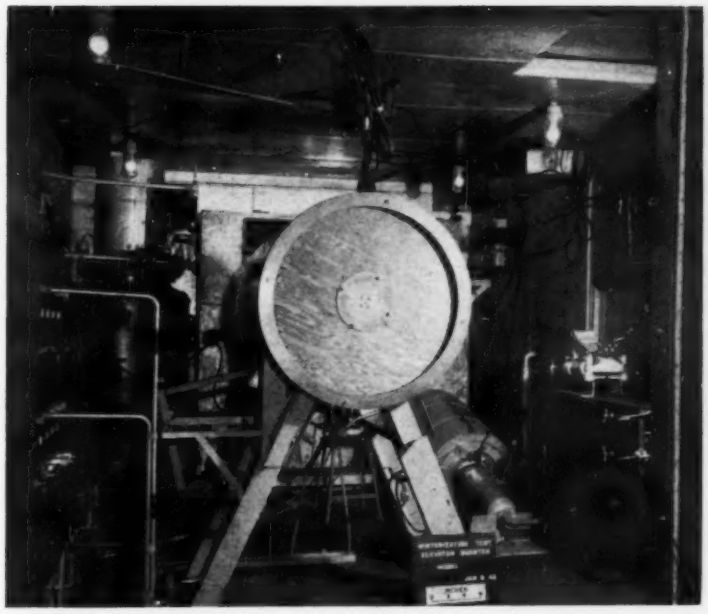
One of the extremely important factors resulting from the broadening of the operational scope of airplanes is the adverse effect of environment upon all portions of the aircraft. The extreme temperature changes to which the aircraft components are subjected in a typical military mission, and likewise in many civil transport flights, are increasingly critical as our airplanes become faster and service altitudes become higher.

Consequently, the aircraft prime contractor and all others associated with the fabrication and servicing of airplanes and their accessories must place more emphasis upon the problems of all-weather operation. The military airplane must be flown and serviced under all sorts of weather conditions. An early attempt to evaluate extreme temperature effects on aircraft components resulted in the development of the Winterization Test Specification TN-TSESE1, issued by the U.S.A.A.F. in 1944. The Winterization Specification was written to provide the airframe manufacturer and his subcontractors with a parameter for the design of units and systems which would operate through the temperature range of —65°F to +160°F. The familiar "yellow dot" was granted to approved components, signifying that a typical unit had passed tests at extreme temperatures with its components assembled to each limit of manufacturing tolerance. This procedure insured that all units made to drawing dimensions would operate satisfactorily in arctic or desert temperatures.

Approximately five years of operation under

Franklyn B. Cole, Jr. is Research Group Engineer with Lockheed Aircraft Corporation.





Figs. 1 and 2. Typical temperature test chambers for aircraft hydraulic systems. CO_2 and methanol are circulated through heat exchangers and fans move the air to give even temperature distribution.

the TSESE1 Specification has proven its inadequacy to provide for all of the environmental conditions which must be faced in current service. Therefore, the Air Material Command, USAF, undertook the development of a more complete formula. The result was USAF Specification 410-65B. The specification, as edited and amended by the cooperative efforts of industry and the military, has become MIL-E-5272 Specification.

MIL-E-5272 is a broad, general, envelope type of specification which sets a pattern for the qualification of Air Force airplane equipment. The various test conditions covered in the specification include temperatures from —85°F to +185°F, altitudes from sea level to 85,000 feet, humidity to 100 percent, exposure to salt sea atmosphere, vibration such as might be met in service, tropical fungus growth, sunshine radiant energy, rainfall, desert sand and dust infiltration and erosion, explosive atmosphere and acceleration and shock incident to flight operations.

Establish Test Sequence

The preceding list indicates the completeness of MIL-E-5272. However, it is only a general specification, and must be applied by calling out the particular procedures of the detail specification to be used in testing of a particular unit. It is obvious that a careful review of the intended

DESIGN FOR PEAK PERFORMANCE AT ALL TEMPERATURE LEVELS

1. Dissimilar metals in intimate contact must be dimensioned to provide for the difference in contraction and expansion.

2. Static and dynamic seals must be designed to perform their function regardless of the dimensional changes of the two adjoining surfaces. A typical seal malfunction found in environmental testing is the low temperature-low pressure leakage of piston rod glands and valve shaft seals.

3. Adequate drainage holes must be provided for inaccessible areas which may collect condensate during changes in altitude.

4. Thorough and complete surface protection must be provided to guard against the corrosive and erosive effects of salt sea atmosphere, moisture, sand and dust, sun radiation and fungus growth.

5. Operating mechanisms must be designed with sufficient structural margins to allow for increased torques and axial forces usually required for extreme temperature function.

6. Care should be taken to avoid designs wherein levers are in close proximity to stationary structure, thus permitting ice to lock the lever when condensed moisture freezes.

7. When other means fail, or where the function of a unit at high altitude or low temperature is critical, local heating of the part is economically feasible.

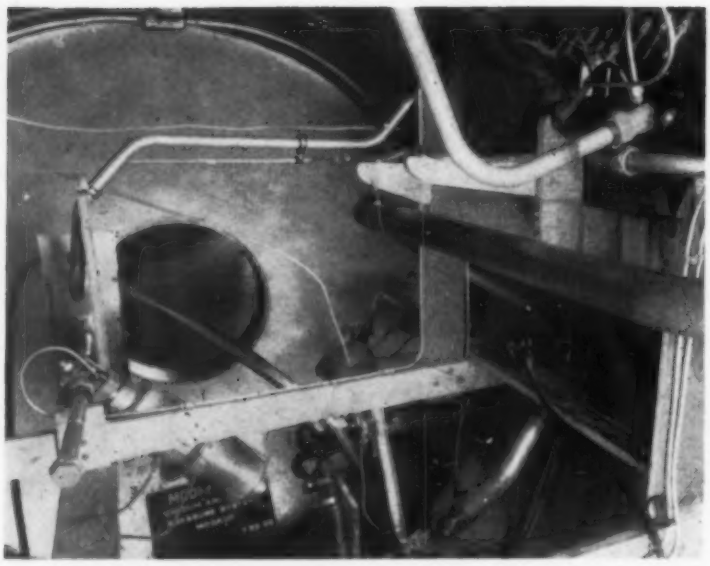


Fig. 3. Mechanical refrigeration cools this altitude test chamber to 0°F and then in combination with a CO_2-methanol circulation system extremely low temperatures are supplied.

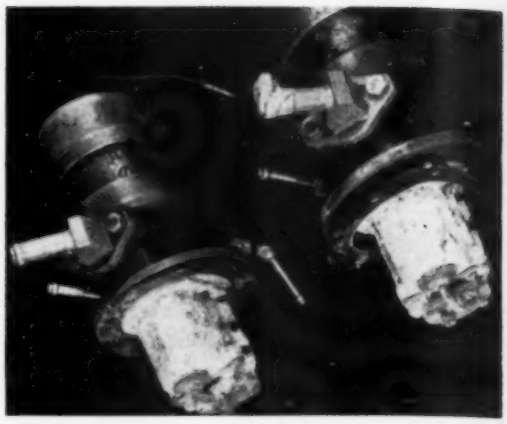


Fig. 4. These aircraft pumps are coated with a heavy precipitate resulting from the action of various types of tap water and alcohol. The problem here is to develop improved corrosion resistance and to provide suitable inhibitors in the fluid.

function of a unit must be made to determine which test procedures are applicable. It is also important to establish the sequence in which the tests are run. For example, the sand and dust test should precede the salt spray test to evaluate the protective paint or plating.

The extreme temperature characteristics of valves, cylinders, pumps and pressure switches are of great interest. At extreme temperatures, the differential expansion and contraction of unlike materials may cause binding or excessive leakage, with the resultant malfunction. At —65°F greases are stiff and operating loads increase greatly. The necessity for the low temperature workability of a grease may require the introduction of undesirable characteristics at room temperature. Swelling and disintegration of certain synthetic rubbers occur in the presence of ANG25 at elevated temperatures. The high viscosity of engine lubricating oils at subzero temperatures causes channeling, foaming and cavitation wear in pumps.

High pressure drop and greater pump power demand result from the increased viscosity of hydraulic fluids at low temperatures. Similarly, contamination of the system with dirty oil occurs

CLIMATIC CONDITION	EFFECT ON HYDRAULIC SYSTEM
EXTREME HIGH AND LOW TEMPERATURES	a. Expansion and contraction of metal parts causes binding, excessive wear and erratic operation of pressure switches, valves and cylinders.
	b. Variations in lubricating grease and hydraulic fluid viscosity causes seal breakdown, pump cavitation, and changes in pump power demand.
LOW ATMOSPHERIC PRESSURE AT HIGH ALTITUDES	a. Pump cavitation due to low suction pressure. b. Condensation of moisture in unsealed chambers. c. Increased brush wear in direct current motors driving pumps and valves.

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The unloading gear pump is designed to replace conventional variable volume pumps with these advantages: lighter weight, longer service life, lower maintenance expense, lower initial cost. This pump will unload up to 90% of rated flow, the remaining 10% being bypassed through a relief valve to obtain zero flow.

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when high pressure drop causes filter relief valves to open.

Conversely, high operating temperatures increase valve leakage, lower efficiency and reduce seal life.

High Altitude Conditions

The design of some pressure switches permits the large changes in ambient temperatures to produce variation in pressure settings due to differential expansion or contraction of the switch mount with relation to the bellows.

Another important environmental factor is the reduction in atmospheric pressure at high altitudes. The most marked effects of the pressure changes occur in units containing a trapped volume of gas as a reference. External case leakage at high altitudes in a differential pressure switch can cause erroneous readings. Pump cavitation at high altitude results from a reduction in suction supercharge. Another important consideration is the breathing of unsealed chambers, which may collect sizable quantities of condensation moisture during descent. The hidden moisture causes premature corrosion in areas not accessible for inspection. Increased brush wear is common in direct current motors driving pumps and valves at high altitudes.

Many aircraft designers are turning to auxiliary heating to insure satisfactory operation of critical hydro-mechanical units at low temperatures. The availability of a hot air supply from jet engine compressors is of considerable help. However, in aircraft powered by reciprocating engines, electrical boots, surface heaters and blankets are frequently necessary.

Test Chamber Design

The laboratory facilities required to evaluate the performance of equipment in various environments are now in a state of furious development. The advent of Specification 41065-B and its successor MIL-E-5272 brought on great activity among manufacturers of test chambers to produce equipment which could simulate all of the various weather conditions set forth in the new directives.

It appears practicable to combine the extreme low and high temperature test equipment in a single chamber design. Two identical chambers placed in close proximity so that one box may be set for low temperature, the other for high

temperature, makes for convenience in performing the temperature-shock tests, in which the test article is transferred rapidly from a +200°F temperature to —40°F ambient. The hot-cold chambers should be designed for easy access and observation of test progress. Floors of the chamber should be designed for heavy loads so that maximum utility can be realized. Consideration should be given to the fact that the test articles must be operated at the extreme temperatures, and it is, therefore, wise to provide a means of moving the parts from one chamber to another without disconnecting hydraulic hose, electrical wiring and the like.

The main chamber doors may be designed with a notch in the lower corner containing a separate insulated plug which can be easily removed to permit entrance of the connections.

Simulating Low Temperature Conditions

Two schools of thought exist in regard to the most efficient method of obtaining the necessary extreme low temperatures. Many test agencies employ carbon dioxide-alcohol sublimation systems. Others prefer mechanical refrigeration. Both methods have merit. The particular extreme temperature test equipment shown in Figures 1 and 2 is operated by circulation of CO_2 and methanol through heat exchangers. Fans are provided to produce proper air movement for even temperature distribution. The large altitude chamber shown in Figure 3 uses a mechanical refrigeration system for cooling to approximately 0°F, and in combination with a CO_2-methanol circulation system will supply the extremely low temperature conditions.

The heating portion of the test chambers must be designed in such a manner as to prevent radiant energy from the heat source falling upon the test specimen. Suitable baffling and a circulation fan provide a satisfactory design. Electric heat appears most suitable, as the fire hazard is at a minimum. All wiring within the test chambers should be vapor proof, since certain fuel system component tests may require the presence of highly flammable fluids.

What's the present status in the development of nonflammable fluids? How will systems withstand high jet aircraft temperatures? Next month Fred O. Hosterman presents a thorough progress report on the development of nonflammable hydraulic fluids.

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"Nip" Pressure Problem

(Concluded from page 48)

been increased a full inch, an advantage which has proven a boon to operators.

When the lower roller is directly below the upper roll, a relief valve opens, directing the pressure against pistons vertically mounted in cylinders at either end of the top frame of the machine. The pistons transmit an even pressure on the closed rotating rolls; the load along the roll is uniform regardless of hide irregularities .

When a hide has passed through the rolls, the operator removes it by opening the rolls. By stepping on the treadle the four way valve reverses, the relief valve closes and the lower roll swings forward away from contact with the upper roll. The machine is then ready for the next hide.

In addition to the ability of the hydraulically actuated rolls to remove more moisture uniformly, other advantages that have resulted in operation are: longer life of felt sleeves by the positive action of the double acting pistons; pressure settings are easy to set and pressure equilibrium is automatic; the reversability of the roll opening and closing has made the machine safer for the operator; and the simpler design has drastically reduced maintenance.

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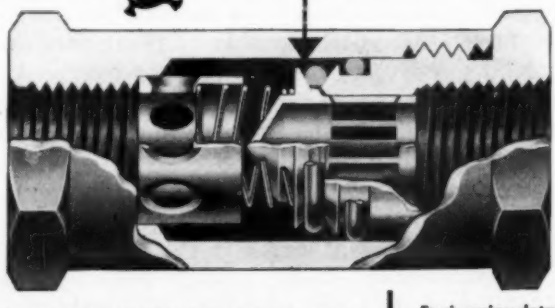

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Test Stands Earn Profits

(Concluded from page 43)

perature causing a high oil viscosity.

The electric power line to the motor is equipped with a reversing switch to accommodate both right and left hand rotation pumps. A kilowattmeter makes it convenient to check pump efficiency when used in conjunction with a stop watch, pressure gage, and fluid meter. By substituting readings for quantities in the following formula, efficiency can be determined.

$$\text{Percent Efficiency} = \frac{\text{GPM} \times \text{PSI} \times 100}{2300 \times \text{KW}}$$

$$\text{Input Horsepower} = 4/3 \text{ KW}$$

This bench permits us to run numerous tests that can be conducted by building up circuits with valves, cylinders, fluid motors, accumulators, intensifiers, and auxiliary pumps. A simple circuit using a pump and relief valve is sufficient for horsepower and efficiency checks. The infinite number of circuits which can be built up are sure to afford an excellent opportunity to use the test bench on a profitable basis for design as well as maintenance purposes.

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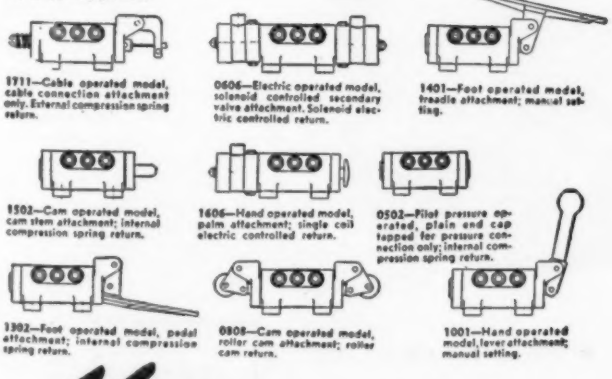

1711—Cable operated model, cable connection attachment only. External compression spring return.

0606—Electric operated model, solenoid controlled secondary valve attachment. Solenoid electric controlled return.

1401—Foot operated model, treadle attachment; manual setting.

1502—Cam operated model, cam stem attachment; internal compression spring return.

1606—Hand operated model, palm attachment; single coil electric controlled return.

0502—Pilot pressure operated, plain end cap tapped for pressure connection only; internal compression spring return.

1302—Foot operated model, pedal attachment; internal compression spring return.

0808—Cam operated model, roller cam attachment; roller cam return.

1001—Hand operated model, lever attachment; manual setting.

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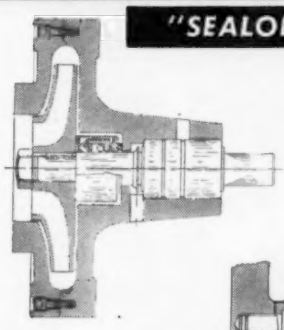

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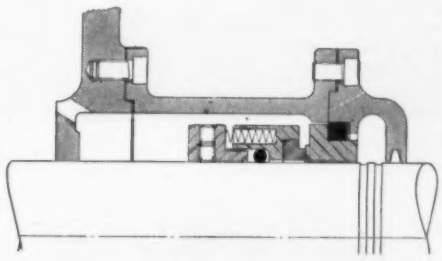

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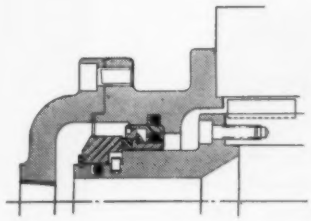
Chemical Pump Seal (dye liquor 20 PSI, 1750 RPM)



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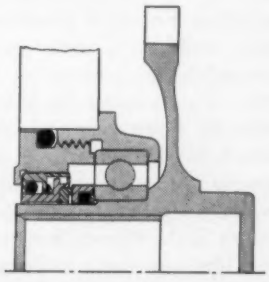

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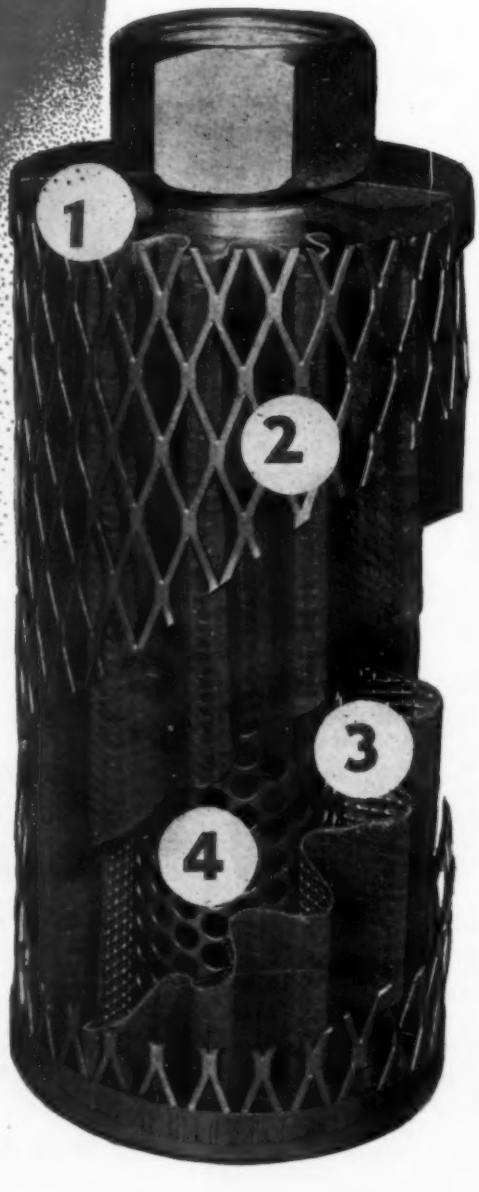


Choice of Over 200 Original Equipment Manufacturers

Leading machine manufacturers have adopted Marvel to preserve the efficiency they build into their machines. Many companies are improving and simplifying their maintenance by standardizing with Marvel filters on all their machines. Available in 5 to 50 g. p. m. sizes with greater capacities obtainable through multiple installations. Mesh sizes from 30 to 200. Marvel has the right answer for filtering non-corrosive liquids in all hydraulic and low pressure systems.

NO MOVING PARTS

1. Neoprene Washers. A perfect seal, oil resistant. No disintegration allowing particles to enter system and retard instant smooth operation.

2. Protective Outer Housing. Exclusive design of Marvel Filters guards fine filtering insert from damage due to careless handling.

3. Reinforced Insert. Extra strong wire for a reinforcement to maintain the design of insert for a long serviceable period.

4. Centering Tube. The core of the filter gives a sturdy construction to the whole unit; adds protection for the pump should maintenance of the filter be neglected.

Marvel Synclinal Filters are simple, efficient and have great capacity for space occupied. This permits longer operation between cleanings. Any workman can disassemble, clean and reassemble a Marvel on the spot resulting in the equivalent of a new unit. No moving parts to get out of order. No need to stock spare parts.

Write for Folder 105

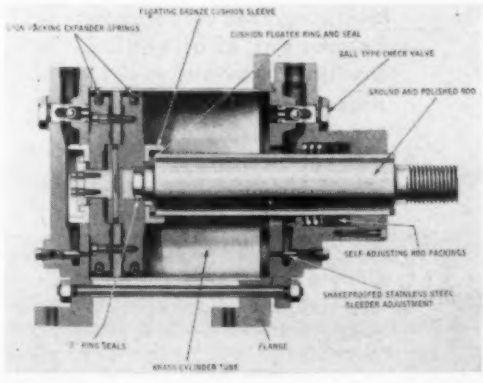
MARVEL ENGINEERING COMPANY
625 W. Jackson Blvd. Chicago 6, Ill.

application and performance of NEW COMPONENTS

PACKAGE POWER UNITS—Three basic standard series of hydraulic power units, with over 200 models available in fixed and portable types, are offered by Haskel Engineering and Supply Co. Low-Pressure (1750 psi) units from 1 ½ to 50 gpm in single pump models, to 100 gpm in double pump models; Hi - Low dual pressure models with automatic unloading of the low pressure pump; Hi-Pressure units (to 10,000 psi) from 1 ½ to 5 gpm in single pump and to 10 psi in double pump models, cover practically every industrial requirement. Features include cylindrical reservoir bases for maximum usage of oil, visible oil level indicator plugs, piston or dial type gages, two drain ports, oil filters, filtered-vented filler caps and baffling for anti-foaming and oil cooling.

Circle 101 on Reader Service Card

LOW PRESSURE CYLINDERS — Manufactured by Hanna Engineering Works, this cross-section of a representative cylinder illustrates the newest design and construction features. The cylinder illustrated is model 4M, one of a complete line of Hanna LP cylinders which operate by, oil or water. Among the unusual features are: a cork floater ring which facilitates cushion alignment with the head and insures a seal during cushioning; spring-backed chevron rod packings which are self-adjusting for consistently correct compression; and the flange design which permits removal of the front head without disturbing the mounting.



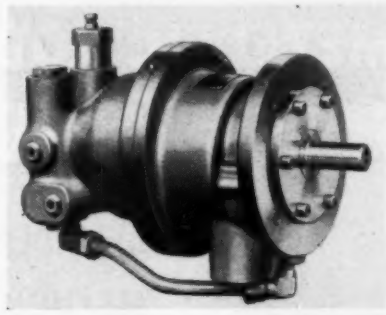
LP cylinders are designed for operation up to 110 psi and, with minor modifications, for higher pressures depending on the cylinder diameter and operating medium. Standard models permit the selection of a cylinder to meet most any mounting requirement.

Circle 102 on Reader Service Card

ANTI-RUST PAINT — PCA-100, a new penetrating and sealing anti-rust paint which can be applied right over rusted surfaces, is introduced by the Paint Corporation of America. Suitable for both interior and exterior use, the new paint is reputed to be equally effective in preventing rust on new metal or stopping rust action on rusted metal. PCA-100 can be applied right over rust without extensive surface preparation such as wire brushing, scraping or sand blasting. Upon application, it penetrates through the rust layer into the base metal and seals the surface against further rusting. The paint is suitable for either brush or spray application.

Circle 103 on Reader Service Card

CONSTANT DELIVERY PUMPS FOR 3000 and 5000 PSI — Simplication and compactness are exemplified in Oilgear's three new heavy-duty Type "HG" axial rolling piston pumps. These proven designs have fewer working parts. They operate quietly at speeds up to 1800 rpm. Coupled with pressure and flood lubrication by the high grade oil in the system, they set new standards of service and endurance for pressures up to 3000 and 5000 psi.



These heavy-duty units are of the fixed stroke type, the volume of oil delivered varying with the drive shaft speed. Oil is delivered in one direction. Each compact unit consists of an axial rolling piston pump, a supercharging gear pump, a gear pump relief valve and an adjustable reverse flow type pressure relief valve. Over 10 hp is transmitted by units only 7x10x13 in. About 135 cipm excess gear pump oil at 100 psi is available for auxiliary purposes. Pump, work and machine are protected against overload.

Circle 104 on Reader Service Card

THERMOSTAT — An entirely new design, originated by the Smith Control & Instrument Corp., eliminates many difficulties which have been characteristic of expanding tube thermostats. The new SCAICO model utilizes a stainless steel tube as the expanding member and an Invar strip as the non-

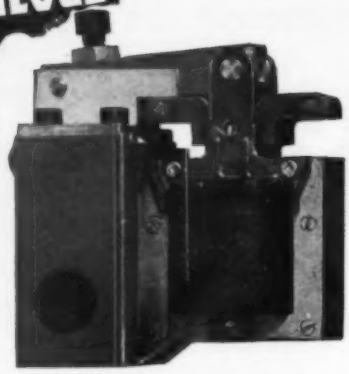
Circle 44 on Reader Service Card

NEW HIGH PRESSURE SOLENOID VALVES

Now available in 110—220—440 volts 60 cycle A. C. current

Features

- Rugged compact construction
- 3000 P.S.I. operating pressure
- Continuous duty
- Poppet design eliminates leakage
- May be mounted in any position
- Impregnated coils resist moisture and condensation



Waterman High Pressure Solenoid Valves are inexpensive, compact units designed for continuous duty in hydraulic systems where pressures are as high as 3000 P.S.I. Poppet type construction gives positive sealing against internal leakage. Impregnated oil resistant coils make these valves suitable for mounting in oil reservoirs. In many cases this feature eliminates costly piping and makes possible the construction of smaller, more compact hydraulic power units. Available in ⅜" pipe size. Electrical requirements are 110–220–440 volt–60 cycle A.C. current.

West Coast: H. E. Webb, 918 No. Kenilworth Ave., Glendale 2, Calif.

WATERMAN ENGINEERING *Company*

721 CUSTER AVENUE • EVANSTON, ILLINOIS

"SEAL-GUARD" METALLIC ROD WIPER

PROTECTS YOUR CYLINDER RODS, MACHINE SPINDLES, GUIDE PINS AND LOCATING PINS

The "Seal-Guard" Metallic Rod Wiper affords permanent protection from falling or flying debris . . . Two flexible bronze rings mounted in synthetic rubber lift off harmful substances completely by means of their knife-edged conical surfaces . . . The device is self-adjusting through action of rubber on staggered scraper rings . . . Rod diameter sizes are from ½ to 10 inches.

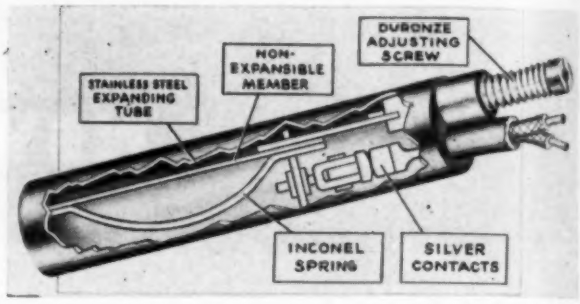
Write for Literature

HYDRAULIC ACCESSORIES CO.

439 E. Fort St. • Detroit 26, Mich.

Circle 45 on Reader Service Card

expanding member. An Inconel spring gives fast make and break action.



A Duronze adjusting screw permits quick and easy setting of the control point at any temperature up to 600°F. and no elaborate heating or cooling procedure is required to stabilize it. Pulling or flexing of the leads can not effect contact position and leads may be conveniently replaced if necessary. Leads of any desired length are supplied.

Circle 105 on Reader Service Card

FLOW CONTROL ELEMENTS FOR INSTRUMENT TIMERS — The Micro Metallic Corporation announces production of accurately calibrated flow control elements, used principally to provide time delays in instrument operations. These elements are fabricated using Micro Metallic porous stainless steel filter material. Elements are commonly assembled into brass or stainless steel housings which are provided with the necessary threaded connections.

Circle 106 on Reader Service Card

HYDRAULIC PUMP ENGINEER

Wanted an experienced hydraulic pump designer by Western Division of nationally recognized corporation. Permanent, challenging position. Previous experience in automotive or tractor engineering desirable but not necessary. Should have mechanical engineering degree or equivalent. Please submit resume including recent snapshot and approximate salary requirements.

Box 8251
Applied Hydraulics

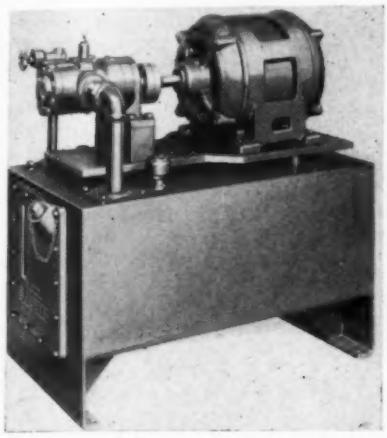
Circle 77 on Reader Service Card

SILICONE RUBBER "O" RINGS — Frederick S. Bacon Laboratories offers a line of silicone rubber "O" rings. The standard sizes range from 3/32 in i.d. to 2 ⅞ in i.d. This new rubber compound has the following physical properties:

Tensile Strength at Break	Greater than 500
Percent Elongation at Break	Greater than 80
Hardness Shore A 2	70-80
Compression Set at 300°F	Less than 33
Brittle Point°F.	Less than -70
Percent Swell in Representative Fluids	Less than 6.

Circle 107 on Reader Service Card

J.I.C. POWER UNITS — Vickers Incorporated has added a new line of hydraulic power units constructed in entire accordance with recommended J.I.C. Hydraulic Standards for Industrial Equipment. These features include: completely sealed tank, with breather air cleaner and separate filler hole having removable mesh screen and chain-attached cap; elevated tank body with dished bottom, drain plug; and cleanout holes at both ends to permit drainage without spillage and complete cleaning of the tank; and flush type oil level indicator with high and low oil positions marked.



Circle 108 on Reader Service Card

1st choice for AUTOMATIC CONTROL

PV-1 Magnetic Normally Closed Valve

PV-2 Magnetic Normally Open Valve

PV-11 Electro Magnetic 3-Way Valve

PV-14 Electro Magnetic 4-Way Valve

GENERAL G|C CONTROLS
801 ALLEN AVENUE GLENDALE 1, CALIFORNIA

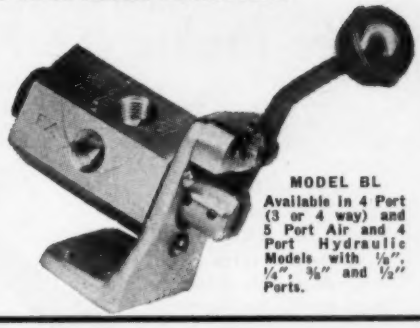
Manufacturers of Automatic Pressure, Temperature, Level and Flow Controls

FACTORY BRANCHES: Baltimore 5, Birmingham 3, Boston 16, Buffalo 3, Chicago 5, Cleveland 15, Columbus 15, Dallas 2, Denver 4, Detroit 21, El Paso, Glendale 1, Houston 6, Indianapolis 4, Kansas City 2, Milwaukee 3, Minneapolis 2, Newark 6, New Orleans, New York 17, Omaha 2, Philadelphia 23, Pittsburgh 22, Salt Lake City 4, St. Louis 3, San Francisco 7, Seattle 1, Tulsa 6, Washington 6, D.C. DISTRIBUTORS IN PRINCIPAL CITIES.

Circle 74 on Reader Service Card

Circle 46 on Reader Service Card

NEW BECKETT *HI-CYCLIC* VALVE!



MODEL BL
Available in 4 Port (3 or 4 way) and 5 Port Air and 4 Port Hydraulic Models with ⅛", ¼", ⅜" and ½" Ports.

PERMITS VARIABLE CYLINDER PISTON SPEED DURING A SINGLE STROKE BY HAND CONTROL

A high performance valve providing **complete control** of air or hydraulic cylinder action. For fixed metering, piston end nuts can be adjusted to obtain any desired speed of cylinder stroke. For full open ports, valve can be obtained with end nuts pinned. At any speed setting, including full open ports, speed of cylinder piston travel during a single stroke can be varied by operating hand lever.

The Beckett Model BL Hi-Cyclic Valve is rugged, compact; readily built into machine tools and production machinery. Write today for complete data on the Model BL and the **complete line** of Beckett Hi-Cyclic Basic, Single and Double, Solenoid, Piloted Air and Hydraulic Valves.

THE BECKETT-HARCUM COMPANY, 1145 Wayne Rd., Wilmington, O.

PEMACO HYDRAULIC AND AIR CYLINDERS with the NEW Cartridge Type Packing Gland

Designed to J. I. C. Hydraulic Standards

Pemaco Hydraulic Cylinders are soundly engineered—give long life and top performance. The steel ram is hardened to 50.C Rockwell, ground and lapped. NOW the Pemaco has the first self-contained Cartridge Type Packing Gland.

This new Pemaco "EASY-PAK" Gland is designed to comply with J.I.C. Standards. It combines double bearing surface, low friction ram seal, and a ram wiper into a single compact unit. Easily maintained, the Pemaco "EASY-PAK" Cartridge Type Packing Gland can quickly be replaced in most cases without removing the cylinder from the machine — and by inexperienced help — greatly reducing machine down-time.

Pemaco "EASY-PAK" Cartridge Type Packing Glands are manufactured for both hydraulic and air cylinders.

PETCH MANUFACTURING COMPANY

Write for complete information and engineering data.

36100 HARPER AVE.
MT. CLEMENS, MICH.

Circle 47 on Reader Service Card

Circle 48 on Reader Service Card

The Higher the Pressure ...the Tighter the Valve

On hydraulic presses of all types this Yarway Hydraulic Valve will give long life with minimum maintenance. Automatically regrinds its own sealing surfaces. Small and compact. Easy to install and operate.

Yarway Single-Pressure Hydraulic Valves are made in straightway, three-way and four-way types; in five sizes for pressures up to 5000 lbs. Also Yarway Two-Pressure Valves in two sizes for pressures up to 5000 lbs. Write for Bulletin H-210.

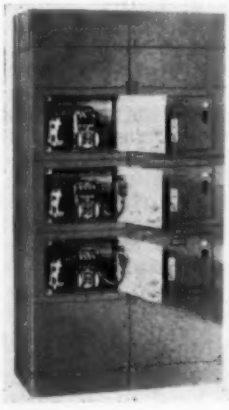
YARNALL-WARING CO.
155 Mermaid Ave., Philadelphia 18, Pa.

YARWAY
Improved Type
HYDRAULIC VALVE

DIAL THERMOMETERS — Versatility of mounting is obtainable with the Palmer thermometer. This mercury actuated dial thermometer is designed so that the stem can be placed at any angle and the case can be rotated to any readable position. Fully compensated by Invar compensation these instruments are guaranteed to an accuracy of 1 scale division. They are available in standard ranges from —40° to 950°F.

Circle 109 on Reader Service Card

ELECTRICAL CONTROL CENTERS — Ward Leonard Electric Co., has developed Multitrol control centers designed for accommodating any control system up to 600 volts, using components not larger than NEMA Size 5. The system can be applied to industrial plant machinery where a group of motors are to be independently or interdependently controlled from a central location. Using the "building block" principle, prefabricated units containing control for a single motor are assembled and wired into a free standing steel enclosure section. Any number of sections may then be bolted and housed together to form a Multitrol center. Built to A.I.E.E. and NEMA standards, the center is available with magnetic full voltage starters, reversing or non-reversing; multi-speed starters; primary or secondary resistance starters and autotransformer starters. Standard starters are equipped with externally operated circuit breakers, thermal overload protection and low voltage protection.



Circle 110 on Reader Service Card

Now! CONTROL AIR OPERATIONS ELECTRICALLY!

PUSH BUTTON OR LIMIT SWITCH CONTROL FOR

- AIR CYLINDERS
- AIR CIRCUITS
- AIR-OPERATED PRESSES

Quiet . . . dependable . . . economical. Unlimited range of applications. Ideal for remote control or for building into equipment. Two types. Ask for Hannifin recommendations.

GET BULLETIN 230
Contains specifications, dimension table, wiring diagrams and other useful data.

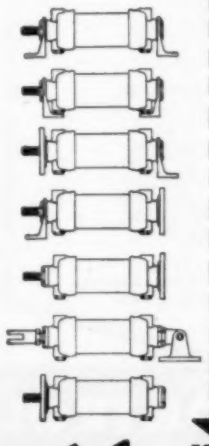
HANNIFIN
HANNIFIN CORPORATION
1155 S. Kilbourn Avenue • Chicago 24, Illinois

Circle 49 on Reader Service Card

Modernair CUSHION TYPE CYLINDERS
WITH
INTERCHANGEABLE MOUNTING BRACKETS

INCREASE PRODUCTION with your PRESENT MACHINERY

Any combination of accessory attachments illustrated below may be used for diversified mountings.



these FEATURES make MODERNAIR CYLINDERS Your Best Buy!

- Compact . . . Positive cushioned action
- Multiple, Diversified mountings
- Swivel heads to simplify installation
- Lighter-weight, rugged construction
- Ease and low cost of servicing
- End cap design suited to special assemblies i.e. tandem models or double piston rod
- Now available in 2-in., 3-in., 4-in. and 6-in. diameters

FOR DESCRIPTIVE BULLETIN — WRITE:

Modernair CORPORATION
TRADEMARK
400 PREDA ST. SAN LEANDRO, CALIFORNIA

Circle 41 on Reader Service Card

ON OLD OR NEW MACHINE TOOL OPERATIONS—

YOU CAN STEP UP YOUR PRODUCTION AS MUCH AS 30%

....WITH THIS SIMPLE, RUGGED, LOW COST AIR CYLINDER!

The pressure for production is on! Manufacturers everywhere find it increasingly difficult to keep pace with the demands of the day. But there is a way—a brand new way requiring no addition to manpower, no addition to plant facilities. The answer? Remarkable Bendix-Westinghouse Robotair Industrial Controls. With their wide range of applications, Robotair controls offer you amazing improvements in production speed and economy through increased productivity of man and machine at *unbelievably low initial cost.* Robotair units are available as original equipment for machinery manufacturers or for easy installation on shop equipment.

Send today for an informative booklet and find out how you can cut costs, speed production with Robotair! Address Bendix-Westinghouse Automotive Air Brake Co., Dept. E, Elyria, Ohio.

CHECK THESE FEATURES:

- ★ Frictionless
- ★ Leakproof
- ★ 100% efficient for total life
- ★ No oilers or filters needed
- ★ Holding pressures up to 5000 lbs.
- ★ Diaphragm has rolling action and exceptionally long life
- ★ Made from high grade steel stamping—all metal parts cadmium plated
- ★ Chrome Molybdenum Steel Push Rod heat-treated for maximum toughness
- ★ Easily installed

FOR HOLDING, CLAMPING, BENDING, SWEDGING, STAKING, RIVETING

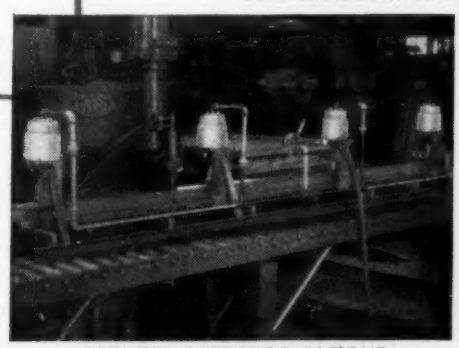
ROBOTAIR

THE INDUSTRIAL AIR CONTROL OF A THOUSAND USES

BENDIX-WESTINGHOUSE ROBOTAIR

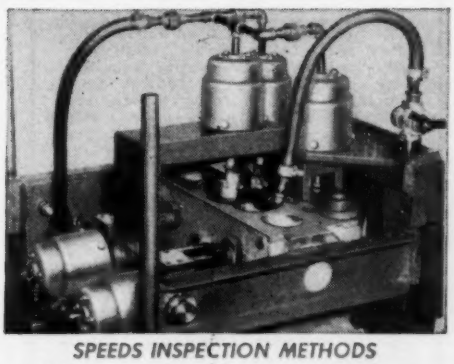
Bendix-Westinghouse

Bendix-Westinghouse Automotive Air Brake Company Elyria, Ohio



REDUCES OPERATOR FATIGUE

Four Rotochambers installed on the fixture in this spot welding operation replaced cumbersome hand clamps, saving time, greatly reducing operator fatigue.



SPEEDS INSPECTION METHODS

Installation of Rotochambers on this water test operation for engine castings eliminated hand operated fixtures, thereby speeding inspection and cutting costs.

Save

BIG MONEY

ON BABBITT
AND IMPROVE YOUR
SERVICE RECORD

by using

PROMET XXX
LONG SERVICE
LEAD BASE
BABBITT

instead of scarce, costly tin base babbitt.

This fine, velvety grain babbitt metal is made entirely from pure virgin metals, perfectly alloyed and heat treated to withstand tremendous loads at high speeds and elevated temperatures that would be dangerous with other babbitts.

Tensile 10,000
Elong 5.5%
Compress. Strength 10,000

Promet XXX will not score, cut or powder even in lubrication failures. The coefficient of friction is considerably less than that of tin babbitts, thus reducing power loss and wear. The entire bearing surface wears uniformly, without pitting.

Simply heat to 900° - 1000° F. and pour. Can be heated to 2000° F. without burning or injury. Repouring only refines it. There is no appreciable shrinkage, hence a better contact with supporting shell, a more solid, rigid bearing.

Promet XXX has been proven ideal for use in blowers, cement mills, clay working machines, compressors, conveyors, crushing machinery, diesel engines, dredges, fans, machine tools, mining machinery, motors and generators, paper mills, pumps, rock and gravel plants, saws, steel mill bearings and sugar mills.

Supplied in 10 lb. pigs

IMMEDIATE DELIVERY

Write today for service data sheets and quotations.

THE AMERICAN
CRUCIBLE PRODUCTS CO.
1303 Oberlin Avenue
LORAIN, OHIO, U.S.A.

Circle 51 on Reader Service Card

(Concluded from page 37)

While single loads of as much as 180 bushels of shelled corn have been reported, one hundred bushels of shelled corn or its equivalent weight may be considered a reasonable load. Any size load may be dumped hydraulically with ease. The rounded protective front permits the tractor to be driven safely through a group of people or a herd of cattle. It protects both the tractor and gates and fences.

Hydraulic Circuit

Twin, 3 inch bore, 24 inch stroke, double acting hydraulic cylinders, clevis mounted on the rear ends of the protective front, are operated by a constant delivery vane type pump that delivers approximately 8 gpm at the working pressure of 800 psi. A multiple unit valve group, consisting of a relief valve, a three-way single acting valve and a four-way double acting valve, controls the operation. The tail end gate, actuated by 1 ½ inch bore, 10 inch stroke, single acting cylinders, is independently controlled. Both bed and end gate movements are controlled by hand lever assemblies operated from the driver's seat.

The tricycle dump tractor, first used off the farm at the St. Louis National Stock Yards, National Stock Yards, Ill., has replaced practically all horses and wagons and trucks of lesser maneuverability at this yard, at the Union Stock Yards, Omaha, Nebr., and at the St. Joseph Stock Yards, South St. Joseph, Mo. These three yards are operating a total of 36 of the tricycle dump tractors.

The tricycle dump tractors are also in use at the Kansas City, Mississippi (St. Louis), Wichita, Amarillo, Ogden, Denver and Ontario (Canada) yards. A total of over 50 units are in regular stock yard use.

The tractor is equally at home on the farm. On the

PLENTY of POWER

IN THESE
HYDRAULIC PUMPS
and
FLUID MOTORS

There's plenty of power in Eastern fluid motors and hydraulic pumps. They're tough and compact—ideal where space is at a premium. They're dependable, too. Long life under rugged operating conditions is built-in. An Eastern hydraulic pump or fluid motor in your design is good engineering.

SERIES 100

.1 to 5 GPM—Drive speeds up to 3450 RPM. Working pressures up to 1000 PSI. Average volumetric efficiency: 90%. Average model weight: 1.65 lbs.

Lightweight construction is obtained through use of aluminum housings and nitralloy gears and shafts. Each unit is factory pre-tested for precision and operating efficiency.

WRITE FOR FULL DETAILS

Eastern
INDUSTRIES, INC.
298 ELM STREET
NEW HAVEN 6, CONNECTICUT

Circle 52 on Reader Service Card

Rickel farm, managed by son Carl, one of the tricycle tractors is in regular use. Employees prefer the tractor to any of several trucks for all except long haul work.

The economy of operation is another outstanding feature. The cost of oil and gas for average work for which the tractor is well adapted is reported much less than for a truck of equivalent capacity. As Mr. Rickel puts it, "the cost compares favorably with the cost of keeping one team of horses shod."

Standard Components Used

All of the welding and assembly work on the tricycle tractor was originally done in a small shop on the Rickel farm. A second building since has been converted into additional shop space; a third farm building is now being converted. Since practically all wearing parts and components are standard, they can be easily replaced. Since the working units are designed to fill special purpose requirements, the small output is in no sense competitive with mass producers.

Attachments, in addition to the original livestock and tree sprayer, e.g., snow blade, manure loader and power loading winch, are in the process of development.

The elder Rickel sees nothing remarkable in the fact that a farmer has become a manufacturer. He believes his operation is a natural development for a large stock feeder, the logical result of an effort to find a mobile spraying and general hauling unit that would be extremely maneuverable in close quarters. The basic simplicity and economy of the tricycle tractor, the use of hydraulic power in speeding work and the adaptability of the tricycle design for efficient operation in restricted areas has built a small but flourishing specialty business.

Valve Selection Simplifies Control

(Concluded from page 39)

closes and over-rides valve 1, applying pilot pressure to port B from port P to pilot chamber J shifting valve position 4, completing the cycle and by-passing pump delivery back to tank through A of valve 4.

If handle 13 had been latched in start position, valve 1 would have been inoperative, therefore, pilot pressure would not have been applied at pilot chamber J of valve 4 but would have been on chamber K through B of valve 13 and the cycle would have automatically repeated when piston of valve 2 was depressed by the cam on the camshaft.

THE MARKET PLACE

Classified Advertising

Rates: For "Positions Wanted" $4.00 minimum, limit 25 words. For all other classifications $4.50 minimum for 25 words, each additional word 15c; bold face type or all capitals, $7.50 minimum for 25 words, each additional word 20c; limit 50 words. Box addresses count as five words.

DISTRIBUTORS OR REPRESENTATIVES — wanted in principal cities to handle complete, quality line of air and hydraulic cylinders, valves and valve actuators. Write, stating lines now being handled, territory covered, and references. Ledeen Mfg. Co., 1600 So. San Pedro St. Los Angeles 15, Calif.

MANUFACTURER WITH FACILITIES SUITABLE FOR DEVELOPMENT AND PRODUCTION OF HIGH PRESSURE, HIGH SPEED AXIAL CAM HYDRAULIC PUMP WANTED. RECENT STUDIES, CONDUCTED WITH COOPERATION OF ARMED SERVICES HIGHLY REGARDED. WIDENED FIELD OF APPLICATION WITH DIRECT TURBINE AND ELECTRIC DRIVE. WILL COOPERATE TO PRODUCTION STAGE AND LICENSE. BOX 8150 APPLIED HYDRAULICS

REPLACE COMPLICATED MECHANISMS WITH Ledeen CYLINDERS

Wherever you have to—

PUSH or PULL

LIFT or LOWER

PRESS or SQUEEZE

TILT or TURN

OPEN or CLOSE

Ledeen cylinders provide positive, dependable power and pressure in straight line motion. Designed for air, oil, or water operation, they are uniform in design and construction, affording a wide number of varieties and adaptations. Ledeen cylinders are easy to install, occupy minimum space, and are built for long, economical service.

Standard Ledeen cylinders and mountings are available from distributors' stocks in major cities. Special cylinders if required. J.I.C., of course.

Ledeen Cylinders are GOOD Cylinders

Write for Bulletin 500

Ledeen Mfg. Co.
1610 So. San Pedro St.
Los Angeles 15, Cal.

Circle 53 on Reader Service Card

Useful Catalogs and Bulletins

available for reference

Hydraulic Power Units . . . Bulletin 45361, issued by Ex-Cell-O Corporation, gives the full engineering application data of the three basic types of hydraulic power units widely used for automatic single-purpose high production machines. Providing automatic cycles for drilling, reaming, counterboring, spotfacing and many other production operations, the units are compact, flexible, easily adjusted and controlled. Multiple units can be remotely controlled. Units can be readily installed or removed for rearrangement of machines for product changes; they are equally efficient as prime movers (milling, boring, etc.) as for one or more of a sequence of operations. The units may be mounted horizontally, vertically with spindle nose down or at any angle between these positions.

Circle 121 on Reader Service Card

Pressure Reduction Valve . . . Saval Division of Wm. R. Whittaker Co., Ltd. offers Design Bulletin 1.1 which illustrates the operation and features of their 22000 series valves. Characteristic curves are plotted. Cross-sectional drawings show the simplicity of adjusting for various flow and pressure settings. The valve designed to absorb abrupt valving surges, provides flow control with minimum pressure drop under maximum flow requirements. Constant flow at reduced pressure is maintained while providing for thermal expansion, contraction or any other volumetric change with complete absence of squeal or hammering. When excessive pressures are built-up in the controlled system, the poppet-type valve acts to relieve the pressure to the reservoir.

Circle 122 on Reader Service Card

Packing Data . . . Service recommendation charts are a valuable feature of an attractive 32 page catalog recently issued by the Packing Division of Raybestos-Manhattan, Inc. The catalog illustrates and describes the 95 most popular packings and gaskets in the R/M line. Complete description of construction is furnished along with size information on each item. The service charts clearly show the packing recommendations for a wide variety of applications.

Circle 123 on Reader Service Card

Basic Data on Hydraulic Fluids . . . "Lubricania" is the title of an informative booklet being offered by Tide Water Associated Oil Company. Written in an easy, clear style the booklet defines the various properties of oil. A page is devoted to definitions, tests and significance of the following important properties: Carbon residue, pour point, viscosity, flash and fire, neutralization number, penetration, specific gravity, color, extreme pressure, steam emulsion, corrosion and uniformity. Two pages are devoted to a lubrication glossary.

Circle 124 on Reader Service Card

Reciprocating Pump . . . Data Sheet 64 A, offered by The Aldrich Pump Company, describes the recently developed 3 in stroke direct flow triplex pump. This 2-color, 6-page bulletin illustrates and presents features of design, construction, dimensional drawings, and performance data.

Circle 125 on Reader Service Card

Wire Braided Hose . . . High pressure hydraulic hose is one of the industrial hose products described in the New York Belting & Packing Co. Catalog. The illustrated construction features show plies of tightly woven, fine, high tensile steel wire over a tube of synthetic rubber resistant to hydraulic fluids. The black cover is of tough neoprene. A specification chart gives sizes and working pressures.

Circle 126 on Reader Service Card

Parallel Circuit Valve . . . Where pressure in cylinders is equal, two or more single or double-acting cylinders can be operated simultaneously by oil directed through the V20 Series parallel circuit valve manufactured by the Hydraulic Equipment Company. Bulletin 108 presents the design features and size specifications for the 5 gpm capacity unit. A differential type adjustable relief valve is built into the control valve housing.

Circle 127 on Reader Service Card

Relays for Industrial Controls . . . Temporary Bulletin 1R511 contains selections from material to appear in a new North Catalog of Relays, switches, and accessories. These eight pages include a partial cataloging of the line, specifications and ordering information that is helpful in the selection and application of relays for the control of hydraulic and pneumatic power systems.

Circle 128 on Reader Service Card

Damping Hydraulic Surges . . . Here is technical, construction and application data on the new Denison surge damping valve. Bulletin VS-1 presents a discussion of hydraulic shock and fully covers the operation of their compact valve which has been designed to prevent the formation of harmful shock pressures. A typical drawing in included to show the simple installation of this valve. Oscilliscope patterns are reproduced to show the effects of the surge damping device in an actual application. This is a very informative technical bulletin.

Circle 129 on Reader Service Card

Moisture Removal from Air Systems . . . Jas. A. Murphy & Co. has issued a series of bulletins describing their line of aftercoolers and separators for the elimination of moisture in compressed air lines. An installation drawing shows how the aftercooler system is designed to fit into the compressed air pipe line system, requiring little space and care. Specifications are tabulated for 9 sizes handling capacities from 80 to 2500 cfm. Sizes to 10,000 cfm are available.

Circle 130 on Reader Service Card

Automatic Control Components . . . 64-page Catalog 700 issued by The Mercoid Corporation includes many control devices applicable to hydraulic and pneumatic systems. Temperature and pressure controls are of particular significance. Dimensional data and operational data are charted along with information on construction features and application recommendations.

Circle 131 on Reader Service Card

Tube Forming Service . . . An interesting brochure has been prepared by the Formrite Tube Co. describing their tube forming service. This leaflet pictorially shows their facilities for producing tubing assemblies to meet your exact specifications. The making of a typical assembly is followed from the high speed cut-off wheels through the burring, bending, flaring and cleaning operations. Also illustrated are the high pressure tube and pipe fittings which are manufactured in accordance with J.I.C. standards and used in the fabrication of assemblies.

Circle 132 on Reader Service Card

Oil Purification . . . Savings in oil consumption and equipment operating and maintenance costs in hydraulic operations are described in a specially prepared, illustrated bulletin published by the Honan-Crane Corporation. The bulletin tells how plants of all sizes have eliminated downtime, mechanical failures and expensive repairs on hydraulic equipment with Honan-Crane hydraulic oil purifiers. Also shown are the correct methods and equipment to keep hydraulic oil clear, clean and safe for use indefinitely—to eliminate costly system clean-outs and oil discard.

Circle 133 on Reader Service Card

Circle 75 on Reader Service Card

ALLEN TRU-ROUND DRYSEAL PIPE PLUGS

100% PRESSUR-FORMD.

- NEVER OUT OF ROUND
- LEAKPROOF METAL-TO-METAL SEAL
- FULL STRENGTH SOCKET WON'T STRIP OR WEAR

Ideal for extreme pressure applications. For use with dryseal taps. No sealing compound required. Pressur-Formd socket, unweakened by drilling and broaching, is stronger than the strongest key. Pressur-Formd burnished threads are nick and distortion-free, insure perfect thread contact, won't gouge softer metals. Perfect taper plus 360° roundness at both pitch and crest diameters assure accurate fit. Now available in 1/16" to 1-1/4" sizes. No increase in price.

Sold only thru leading distributors. Write direct for samples and engineering data on Allen Dryseal plugs, also Allen Tru-Round *Standard* Pressur-Formd plugs for a better seal in normal applications.

WARNING
Allen-TYPE screws aren't necessarily Allen-MADE. Be sure to get genuine Allens in the black and silver box.

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Best for Trigger-Quick Control of All Air Operated Equipment
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Circle 54 on Reader Service Card

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Now... a model and size to solve any hydraulic line problem!

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QUICK COUPLERS
For All Hydraulic Lines!

Just a "Twist-of-the-Wrist" to connect under pressure

- Standard and Break-A-Way types
- Connect under pressure without tools
- Thousands in use

WRITE FOR FULL DETAILS

ULRICH Manufacturing Co.
ROANOKE ILLINOIS

Quick-Connect Shut-off Coupling . . . A four page bulletin illustrates the construction, operating principle and size specifications for the Hansen Series 8000 two-way shut-off coupling. This coupling provides instant disconnection, automatic sealing of both ends of a fluid line, and practically eliminates spilling of liquid or escape of gas when disconnecting the coupling. Widely used on pneumatic and hydraulic lines, the fluid lines are immediately separated when the coupling sleeve is pulled back.

Circle 134 on Reader Service Card

Quick Hydraulic Coupler . . . Developed by the Pioneer Pump Mfg. Co., this connect-disconnect coupling is guaranteed not to leak at service pressures up to 3000 psi. Described in an available bulletin sheet, the coupling has the very low pressure loss of 13 pounds at 10 gpm at 1000 psi.

Circle 135 on Reader Service Card

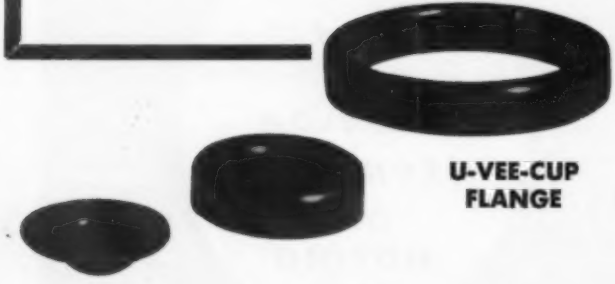
Filters for Hydraulic Systems . . . A series of specification sheets are available describing each size range and style of Cuno Auto-Klean filters. Each sheet illustrates the construction features of the permanent all metal filter element which is continuously cleanable, either manuallv. or by motor without any interruption in flow or service. Flow capacities and sizes are charted.

Circle 136 on Reader Service Card

Oil Seals . . . Johns-Manville has issued a mould list for their Clipper Seals. This list which is 15 pages long and includes hundreds of seal sizes for the six types of seals, will assist you in the selection of the proper size seal for your application and will serve as a design and drafting aid. A second Catalog gives complete installation and application data on the Clipper Seal.

Circle 137 on Reader Service Card

RHOADS
Tannate®
LEATHER PACKINGS



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Stock Fewer Spares . . . You Can Use
Nicholson Valves for Any Pressure Medium

Nicholson control valves offer maximum adaptability. A rubber processor reports that they carry only 1 spare valve for each 52 in service. Unlike many poppet or balanced piston valves, they can be used for steam as well as air, gas, oil or water. Lever, foot, solenoid, motor types; size ¼" to 2½"; press. to 5,000 lbs.

To see their wide applications send for . . .
Catalog 1250

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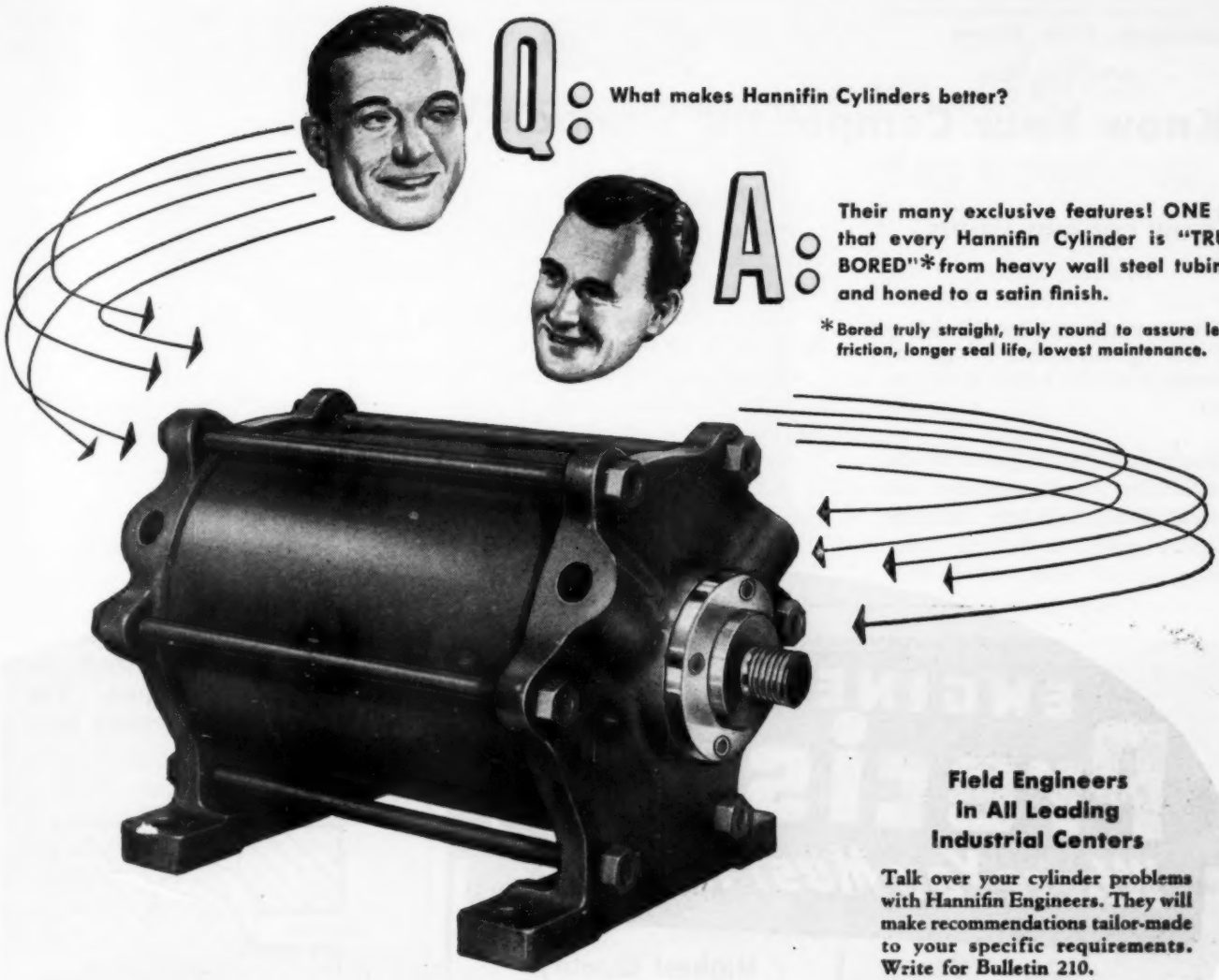
Sales and Engineering Offices in 53 Principal Cities



Q: What makes Hannifin Cylinders better?

A: Their many exclusive features! ONE is that every Hannifin Cylinder is "TRU-BORED"* from heavy wall steel tubing and honed to a satin finish.

*Bored truly straight, truly round to assure less friction, longer seal life, lowest maintenance.

Field Engineers in All Leading Industrial Centers

Talk over your cylinder problems with Hannifin Engineers. They will make recommendations tailor-made to your specific requirements. Write for Bulletin 210.

If you check on each operation in the manufacture of hydraulic and pneumatic cylinders, you will know why Hannifin precision methods are superior. Cylinder bodies are piloted into end caps for permanent concentricity of parts; complete standardization is maintained for maximum interchangeability; all cylinders are identified with individual serial numbers registered for life in factory records—it is this careful workmanship and attention to detail that assure maximum utility and minimum "down time" when you specify HANNIFIN CYLINDERS. Hannifin Corporation, 1155 S. Kilbourn Ave., Chicago 24, Ill.

THERE IS A HANNIFIN ANSWER TO EVERY HYDRAULIC AND PNEUMATIC CYLINDER NEED

do All you can do . . . with

HANNIFIN

Standards File Sheet

Know Your Component Symbols

FLOW CONTROL VALVES

Hydraulic Series

The seventh in a series showing the symbol and a typical schematic of the valve it represents.

Designing for a given speed of cylinder travel requires the control of oil delivery because cylinder speed is directly proportional to oil flow. To provide flexibility to the hydraulic system the designer wants a valve which will vary the flow of oil to the cylinder.

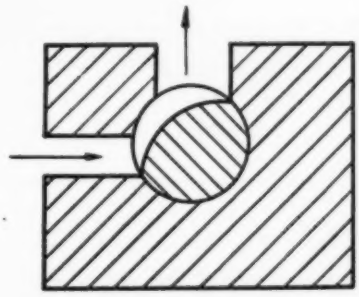
Basically the valves provide a variable orifice, that is, the full diameter of the delivery pipe may be varied from zero to maximum by the control of the valve.

The simplest device is a needle valve which is often called a line restrictor. The schematic sketch clearly shows

Typical Needle Flow Control

its operation. Adjustment is made by changing the position of the needle.

Another style of metering valve uses a round shaft for limiting flow of liquid. The half moon groove causes flow



Metering Shaft

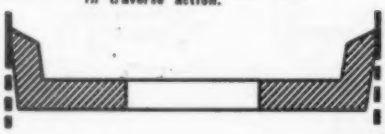
to increase or decrease as the shaft is rotated. When the valve is set to give the required speed, means is provided for locking the shaft in position.

Because the rate of flow from the metering valve would vary with variations in operating pressure if only a variable orifice or needle valve is used, these valves are built in combination with a pressure compensating device. This device is actually a pressure reducing valve set to maintain constant pressure on the inlet side of the metering valve.

Further, it is usually desirable to have controlled flow in one direction and free flow in the reverse. To provide this, a check valve is built in the same

ENGINEERED
Precision
Where You Must Have It!

Cup is precision molded to hug cylinder wall and sweep in traverse action.



Highest Quality Molded Packings For HYDRAULIC and PNEUMATIC CYLINDERS PRESSES • PUMPS VALVES

Low cost insurance against leakage and failure regardless of pressures. Low maintenance costs. PERIFLEX packings are pressure molded from a special quality neoprene and fabric compound and are held to precision limits. Let us send you our catalog that lists the wide range of standard molds carried in stock.

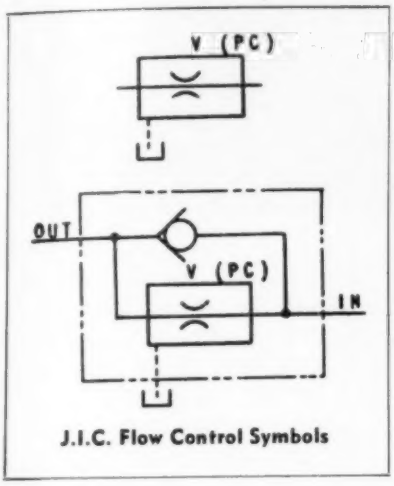
CUPS FLANGES "U" RINGS "O" RINGS

Periflex Inc.

HAZEL PARK • MICHIGAN

housing with the metering valve.

Another combination has a pressure compensated metering valve and an overload relief valve in the same housing.



J.I.C. Flow Control Symbols

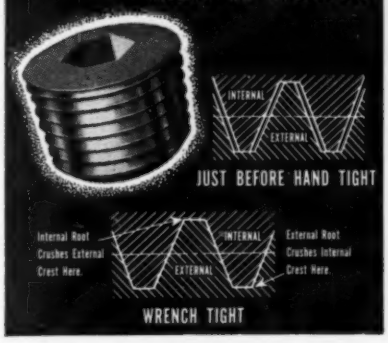
The J.I.C. symbol for a flow control valve indicates an orifice, the small "v" means that the orifice may be adjusted to give variable flow and the (PC) tells us that the valve is pressure compensated.

Circle 60 on Reader Service Card

UNBRAKO®

DRYSEAL-Thread PRESSURE PLUG

HOW IT WORKS



SEALS TIGHT WITHOUT COMPOUND

Unique thread design of UNBRAKO "DRYSEAL" Pressure Plugs provides positive sealing at both major and minor diameters of threads, preventing spiral leakage, even under extreme pressures. Full range of sizes from 1/16" to 1¼" N.P.T.F.

Write for Bulletin 675.

—SPS—

STANDARD PRESSED STEEL CO.

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Circle 61 on Reader Service Card

LET *Aetco* TEST IT FOR YOU

- AN-Qualification Testing Is Our Specialty
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Shall Be Glad To Counsel With You

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AIRCRAFT EQUIPMENT TESTING COMPANY

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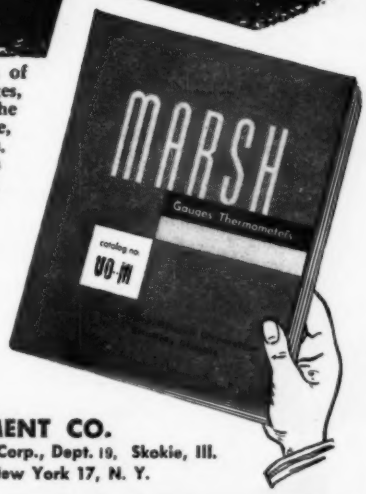
Know the scope of the MARSH line of pressure gauges



There are literally thousands of combinations of types, ranges, case styles and connections in the broad Marsh line of pressure, vacuum and compound gauges. As a result, gauge requirements that would be "special" to others are often standard to Marsh.

This means that we can meet your gauge needs better and more economically . . . whatever the service condition, quantity or design requirement. To know the scope of Marsh Instruments just ask for the new fact-filled catalog.

MARSH INSTRUMENT CO.

Sales affiliate of Jas. P. Marsh Corp., Dept. 19, Skokie, Ill.
Export Dept.: 155 E. 44th St., New York 17, N. Y.

Circle 62 on Reader Service Card

Quick-As-Wink AIR AND HYDRAULIC Control Valves

No. 1491-CS-3
½" 3-Way Solenoid Operated Air Valve

***SOLENOID OPERATED* Air Valves**

fast, positive, dependable operation

● These valves are widely used for controlling single action air cylinders, clutches, etc. Can be operated with a variety of power switches, mercoid switches or automatic contact switches activated by moving objects. Stainless steel push-pull rods, brass sleeves and U-packings expanded by pressure and all enclosed against dirt, assure long, efficient, trouble-free operation. No metal to metal seating. Precision made. Individually tested. Spring or double solenoid return. ⅜" to 1½" sizes: 2-way, 3-way and 4-way actions. *Write for full details.*

THE HIGHER THE PRESSURE THE TIGHTER THE SEAL

Quick-As-Wink AIR AND HYDRAULIC Control Valves

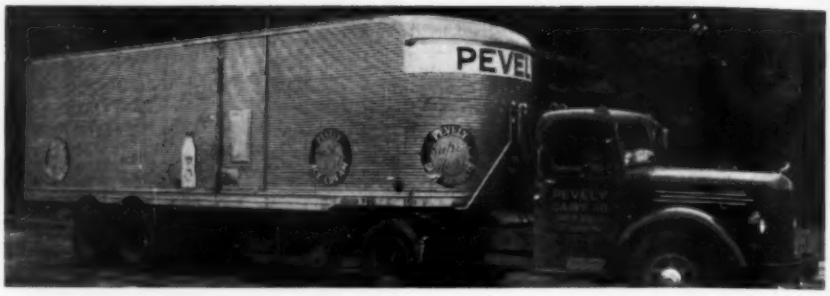
Hand, Foot, Cam, Pilot, Diaphragm and Solenoid Operated

Mfd. by C. B. HUNT & SON, INC., 1969 E. Pershing St., Salem, Ohio

Circle 63 on Reader Service Card

Hydraulic Drive Helps Double Ice Cream Deliveries

THE PEVELY DAIRY COMPANY of St. Louis, by taking advantage of a unique hydraulic pump drive for the compressor on a long haul ice cream trailer truck, has doubled the number of days the truck carries a pay load, it has increased the pay loads and the radius of operation and it has greatly reduced maintenance.



Since hardening room temperatures—twenty degrees below zero F—are essential to avoid "heat shock", it was formerly standard practice at the end of empty return runs to lay up the trailer for approximately 24 hours to pull down the temperature. This was necessary because of the size and number of hold-over plates. Engine driven compressors operated continuously; the average engine consumed approximately 10 gallons of gasoline per 24 hour period.

Obviously, this was a costly procedure.

Kold Trux, Incorporated of St. Louis, fortunately, had the answer to the problem. A special design piston pump, shaft driven off the truck engine, drives the compressor. For periods when the engine is not running, an electric motor can be plugged in at any stop where a 110-120 line is available. For short periods, such as customer stops, it was not even necessary to do this.

Equipment Specially Designed

The arrangement required no special mechanical components. The Kold Trux company designs and builds the hydraulic equipment and installs the unit. The system employed is protected by patents granted and pending. The trailer temperature is held to a plus or minus 5 degrees F tolerance within the hardening room temperature at all times; there is no appreciable heat rise on a return trip.

Since the trailer could be kept in daily operation, the radius of operation was extended. Trips up to 600 miles are now regularly scheduled, much farther than was practical previously in the heavy summer sales period.

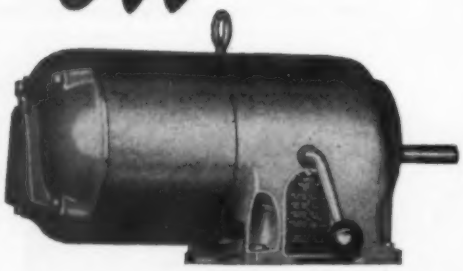
LIMA GEARSHIFT DRIVES

Offer

☆ INCREASED PRODUCTION

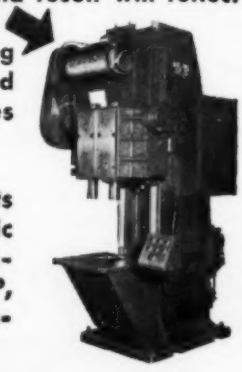
☆ GREATER MACHINE FLEXIBILITY

☆ LOWER OPERATING COSTS



If production costs are out of balance with selling prices, and cutting into profits, it will pay you to investigate the advantages of LIMA GEARSHIFT DRIVES. Lima Drives will increase production, give greater machine flexibility, and, at lower costs. The end result will reflect in Greater Profits.

LIMA maintains a national Sales Engineering staff to assist you in solving your selective-speed drive problems. Let LIMA recommend the drives you need.



Lima Gearshift Drives are making increased profits for the users of the Moline No. 113FB Hydraulic Rail Feed Machine, built by the Moline Tool Company, Moline, Illinois, and powered by a 7½ HP, Type R4 Lima Gearshift Drive *as standard equipment.*

LIMA

ELECTRIC LIMA MOTORS

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2740 Findlay Road • Lima, Ohio

Circle 65 on Reader Service Card

SAVE UP TO 85% in WAR SURPLUS HYDRAULICS

SPECIAL BARGAIN #29 HYDRAULIC CYLINDER

Gives 20,000 lbs. thrust (push pull) using 1500 PSI line pressure as obtained from our hyd. pumps. Or will produce 40,000 lbs. thrust with 3,000 lbs. line pressure. CAN ALSO BE OPERATED ON LOW PRESSURE AIR SYSTEMS. 4" Bore, 1⅞" dia. piston shaft, 18" stroke, length 30½". Equipped with ball bearing loaded clevis type mounting and swivel type high pressure steel pipe bracket for easy use. Ideal for road farm and shop machinery, presses, etc. Cost Government $390.00 . . . . . NOW **29.95**

3A HYDRAULIC CYLINDERS

NO. 3A – Bore 1½", Shaft ½" Stroke 5", Length 10½" **5.75**

NO. 9E – Bore 1-5/8", Shaft 1" Stroke 15-5/8", Length 15¾" **8.50**

NO. 35 – Bore 1½", Shaft 1" Stroke 26", Length 23½" **15.75**

AN-Hi-PRESS. HOSE (FUEL – OIL & AIR)

1/4" Tube Size – 7/16 x 20 Thread – 16" long with Male and Female fitting at either end. . .95¢ each.

1/4" Tube Size – 7/16 x 20 Thread – 22" long with Female fittings at both ends. . . . . .95¢ each.

3/8" Tube Size – 9/16 x 18 Thread – 20" long with Female fitting at both ends. . . . . $1.90 each

Same as above but 63" long. . . . . $3.75 each

1/2" Tube Size – 3/4 x 16 Thread – 24" long with Female fittings at both ends. . . . . $2.65 each.

Same as above but 67" long. . . . . $3.75 each.

5/8" Tube Size – 7/8 x 14 Thread – 15" long with Female fittings at both ends. . . . . $2.25 each.

Same as above but 36" long. . . . . $2.95 each.

FOUR WAY VALVE

V-2B – Poppet Type. Off at neutral position. 3/8" AC Tube Parts – (9/16 - 20) thread. P.S.I. 1,500 . . . . . **4.75**

V-17 – Poppet Type. Pressure balanced. Off at neutral position. Piston type with built-in relief valves for limit of cylinder strokes. ½" Standard pipe inlet & outlet ports. ½" AC tube to cylinder (¼" - 18) thread tapped ports. NEW **8.75**

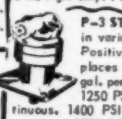
We carry the World's Largest Supply of New Hydraulic Equipment featuring over 20,000 Cylinders in 61 Sizes & Types. Can also supply all accessories such as Pumps, Fittings, Valves, Tanks, Hose Fittings. Let us solve your Hydraulic problems. Write for inform.

HYDRAULIC TRANSMISSION

Self contained, 2 H.P. constant torque at all speeds with variable volume reversible, piston pump (controlled by outside lever.) supplying piston hydraulic motor. Automatic pressure, Dash pot for smooth control. Power output R.P.M. – 0 to 1/3 input R.P.M. in both directions. Input R.P.M. 1800 continuous 4000 intermittent. Dash pot can be removed for greater R.P.M. Ideal for Lathes, Duplicator Setup on Mills, Conveyors, Small Cars, Drives, Gearing, etc. Includes 2 - 4" Spline Shafts for input and power take-off. Cost Government approx. $400.00 **32.50**

HYDRAULIC PUMPS

ANGLE PUMP Positive displacement type, angle piston. Displaces .507 cu.in. per revolution. Has capacity of 6 gal. per minute at 3000 RPM at 1500 PSI continuous 1875 for 15 seconds. Operating speed of 3750 RPM, intermittent maximum 4500 RPM. Rotates to the right only. . . . . NEW **17.50**



P-3 STRATO POWER PUMP With built-in variable flow control valve in head. Positive displacement piston type. Displaces .450 cu. in. per revolution. Two gal. per minute capacity at 1500 RPM at 1250 PSI. Pressure limit, 1250 PSI continuous. 1400 PSI for 15 seconds. Operates at 3750 RPM, intermittent max-4500 RPM. Rotation either direction without adjustments. NEW **17.50**

GEROTOR TYPE PUMP

Logan Gerotor type. For operating hyd. systems on tractors, trucks industrial machinery, etc. Delivers 8 GPM, at 1200 RPM, at 1000 PSI with 5 HP. Can also be used as Hydraulic Fluid Motor. Has 3/8" stnd, pipe ports, ½" splined shaft for pulley or direct attachment. 5½" dia. x 7" lg. Used but guaranteed condition. Now ONLY **19.50**

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– WRITE FOR 1951 CATALOG – OVER 200 PAGES OF BARGAINS in machine tools (taps, drills, dies, reamers, etc.). Hydraulic Cylinders, Valves, Pumps & Motors, Air Tools & Bearings.

Circle 66 on Reader Service Card

'Shear-Seal' Valves

The 'Shear-Seal' Principle is an exclusive Barksdale development for control of extreme pressures. Fluid flow is always through the center of the 'Shear-Seal'—NEVER between sealing surfaces as in conventional valve principles. Optically flat sealing surfaces of 'Shear-Seals' and porting disc (rotor) are protected by perfect contact at all times. Erosion or 'wire drawing' are not experienced even with extremely dirty high velocity fluids. The higher the pressure, the tighter the seal.

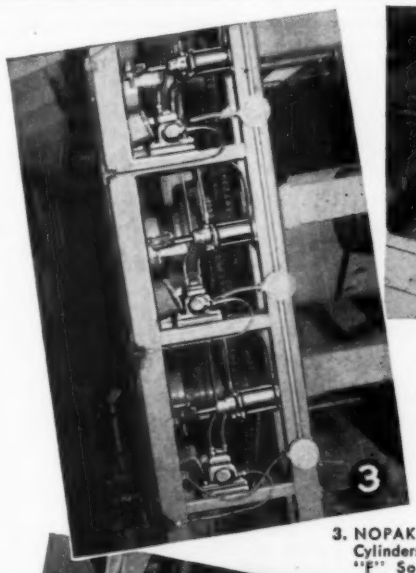
Exceptionally easy operation of Barksdale valves, regardless of pressure, is due to a balanced hydraulic load on the 'Shear-Seals' further relieved by large ball thrust bearings.

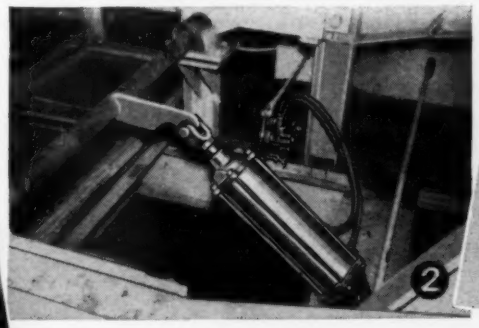
Self-alignment and wear compensation of 'Shear-Seals' plus their self cleaning and polishing action against the rotor actually improve the valve with use.

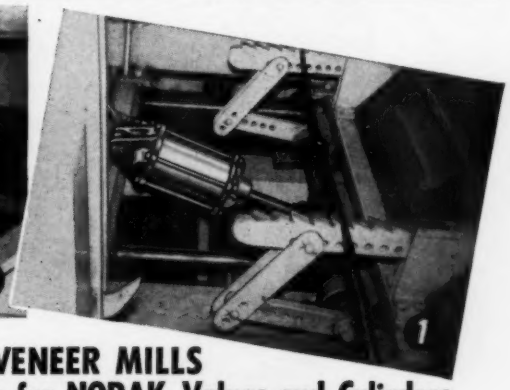
Write for the new Manual Valve Catalog 1B-1, which covers 4-Way Selector, Shut-Off, Dual Pressure Selector, and other Barksdale valves for pressures ranging from 0 to 6000 psi.

BARKSDALE VALVES

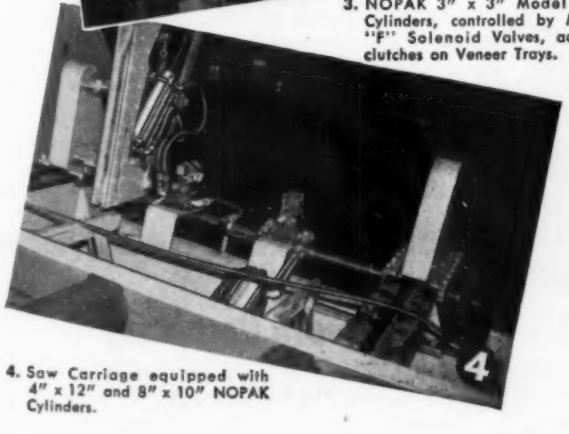
1566 EAST SLAUSON AVENUE • LOS ANGELES 11 • CALIFORNIA







1. Cant Flipper actuated by NOPAK Model "E" Cylinder.
2. Log Deck Flipper-Arm Set-Up operated by 6" x 18" Model "E" Cylinder controlled by NOPAK Model "R" Foot Valve.
3. NOPAK 3" x 3" Model "E" Cylinders, controlled by Model "F" Solenoid Valves, actuate clutches on Veneer Trays.



4. Saw Carriage equipped with 4" x 12" and 8" x 10" NOPAK Cylinders.

LUMBER and VENEER MILLS Find Many Uses for NOPAK Valves and Cylinders

The four applications pictured here are typical of hundreds now in operation in the lumber and wood products industries. Lifting, tilting, pushing, pulling and clamping operations are readily simplified and accelerated through proper application of NOPAK Valves and Cylinders of the correct size and type.

In modernizing machines or equipment which you use in your own plant, or build for others, consider the advantages of using Air or Hydraulic Power the NOPAK way. For data and descriptions, refer to Sweet's File for Product Designers, or write for Bulletin SW-1.

GALLAND-HENNING MFG. CO., 2743 S. 31st Street, Milwaukee 46, Wis.

•

Representatives in Principal Cities

NOPAK

VALVES AND CYLINDERS

DESIGNED for AIR and HYDRAULIC SERVICE

A 5913-½H-A

Circle 68 on Reader Service Card

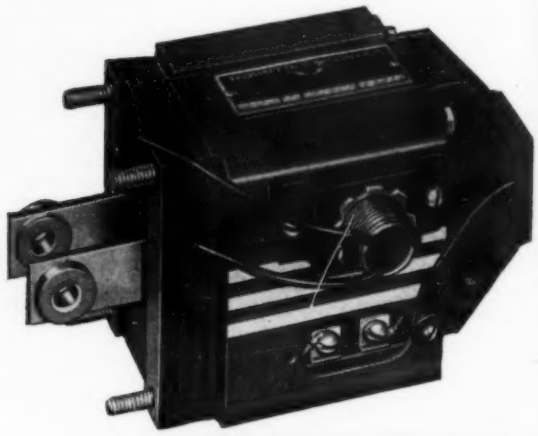
The "M" Series valves are approx. 4⅝" high, yet have extremely fast action and large capacity for liquids, air and inert gases! They have soft insert seats to prevent leakage — will operate in any position — nylon fabric coated diaphragm for long life — max. power consumption 10 watts — continuous duty! M-2 two-way normally closed — 5 to 150 p.s.i. — port size ⅜" or ½"; orifice ⅜" — pilot operated. M-3 three-way normally closed, three-way normally open or directional flow — 20 to 150 p.s.i. — port size ⅜" or ½"; orifice ⅜" — pilot operated. Special models available.

Write for Bulletin No. 493

Skinner ELECTRIC VALVE DIV.
THE SKINNER CHUCK COMPANY
142 Belden Ave., Norwalk, Conn.

Circle 69 on Reader Service Card

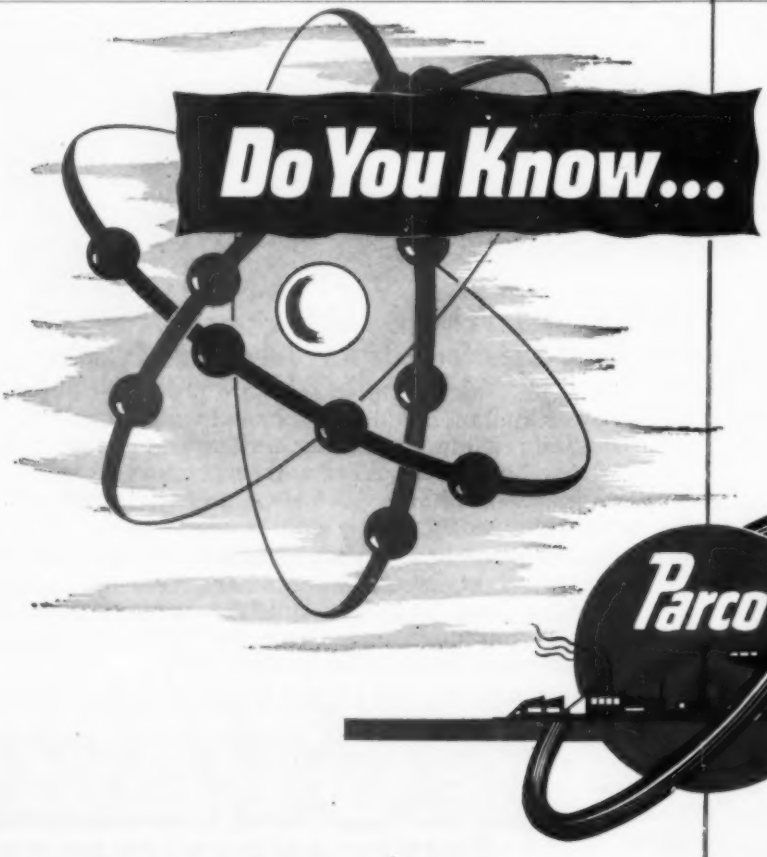
SOLENOIDS FOR HYDRAULIC VALVES . . . . .



G-611-X SOLENOIDS

- Trombetta G-600 solenoids are specially designed to meet severe operating conditions
- Make your selection from our complete line of standard or special solenoids
- Solenoid brakes of all sizes are also available

TROMBETTA SOLENOID CO.
331 N. Milwaukee Street • Milwaukee 2, Wisconsin



That in addition to natural rubber, there are six basic synthetic elastomers from which Parco "O" rings are manufactured? When properly compounded and processed, the most desirable inherent properties of each can be brought out, making them suitable for most applications requiring a simple, economical, and efficient sealing mechanism. Because of their years of experience, Parco engineers are best qualified to recommend and tailor Parco balanced compounds for your needs. Consult them!

All dash numbers of 6227, 6230 and 6290 series for commercial applications or Army-Navy installations to Specifications MIL-P-5516 (6227 and 6230) and MIL-P-5510 (6290) are available from stock.
"O" ring packings to your specification are available on order.

Plastic and Rubber Products Company
2100 Hyde Park Boulevard, Los Angeles 47, California
820 North State Street, Chicago 10, Illinois

Circle 70 on Reader Service Card

POST SCRIPTS OF INDUSTRY

NEWS · VIEWS · TRENDS

William L. Harris, former production manager and development manager of the Allis Rubber Corporation, division of the Chicago Belting Company, has joined **International Packings Corporation** as assistant superintendent.

Gordon Miscall has joined **The Parker Appliance Co.** as industrial sales engineer. Miscall will represent the company in the area comprising southern, Ohio western Pennsylvania, West Virginia and Kentucky. He succeeds **H. C. Jacobs,** now representing Parker in northern Ohio and Indiana, an area previously served by **C. D. Uldricks,** presently Pacific coast representative.

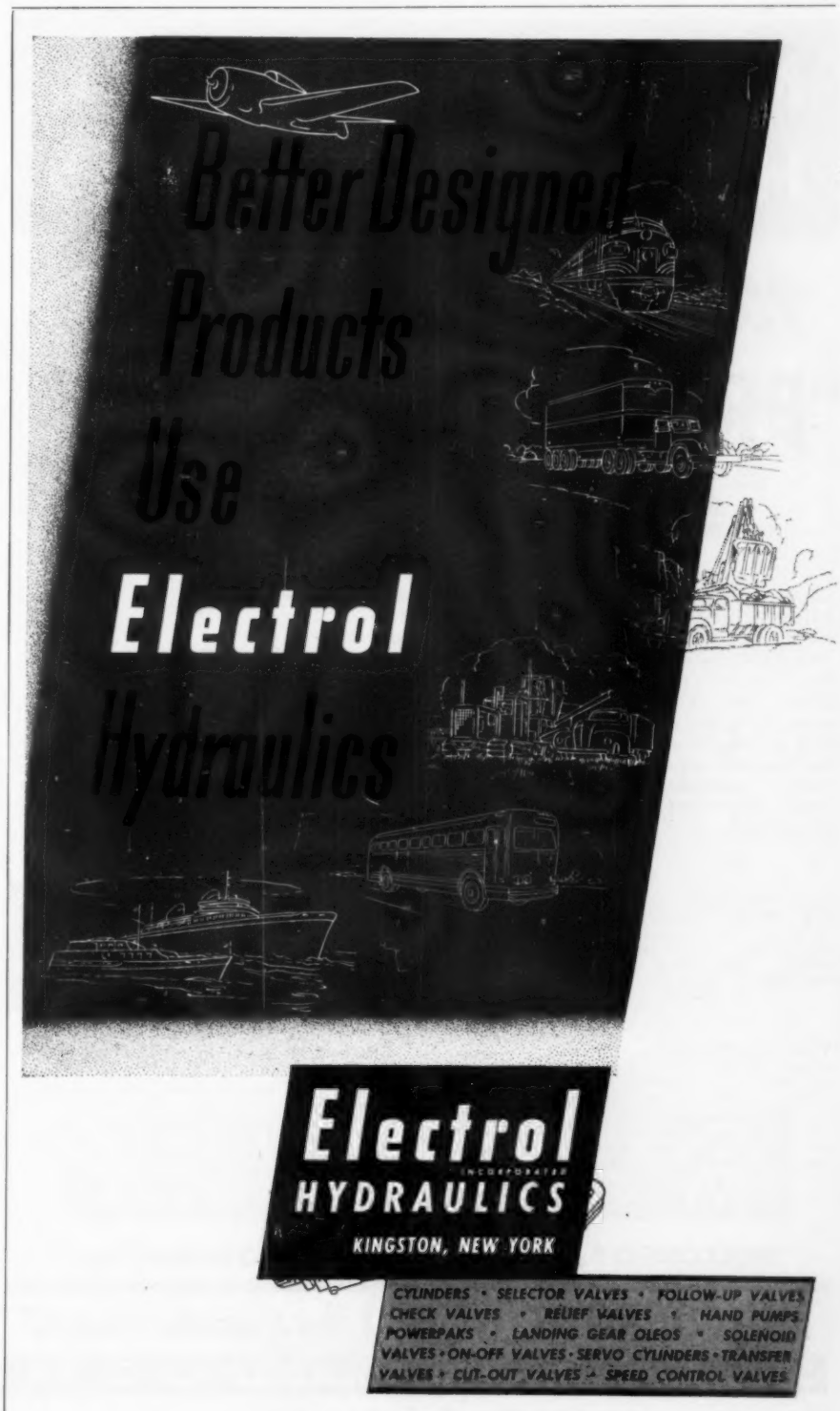
F. R. Dickerson has been promoted to general manager of the pump division of the **Geo. D. Roper Corporation,** Rockford, Illinois, it was announced by Roper president, Stanley H. Hobson. Mr. Dickerson studied at Beloit College and the University of Illinois.

F. R. Dickerson

The Jack K. Kolberg Company of Rochester, N. Y., representatives for Hansen Quick-Connective Couplings in northern New York, is now operating on a 24 hour basis for the benefit of plants in that area which are working around the clock. The company's office facilities at 662 Monroe Avenue in Rochester have been enlarged and improved. In addition, an inventory of couplings is now being carried to facilitate quick delivery.

Harry P. Kupiec, for many years active in the aircraft hydraulics field, has joined the **Aircraft Equipment Testing Company** at 1806 Fleet Street, Baltimore 31, Maryland, as General Manager.

The Cleco Division of the Reed Roller Bit Company has named the following distributors: Dawson Tool & Abrasive, Inc., Seattle, Washington; Cohen Auto Parts, Inc., 2615 Peach Street, Erie, Pennsyl-



Circle 71 on Reader Service Card

vania; The Ridley Company, San Francisco, California; A. J. Baxter & Company, Detroit, Michigan; and Gesner Equipment Corporation, P. O. Box 472, New Haven 2, Connecticut.

L. A. Russ, director of management development for the **Westinghouse Electric Corporation,** has appointed **H. B. Kiphuth** as assistant director of management development.

L. M. Evans has been put in charge of the new Rochester, N. Y. branch office of **Worthington Pump and Machinery Corporation.**

Periflex, Inc., formerly Platen Products Company, announce the trade name, Periflex, for their line of precision molded packings. Their new address is 111 East Ten Mile Road, Hazel Park, Michigan.

The Hilliard Corporation has appointed **Guy T. Martin & Company,** 642 East Olive Street, Gardena, California as their representatives in this state.

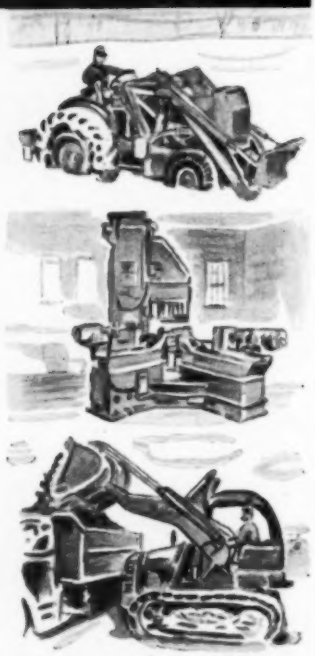
Thomas N. McGowen, Chicago industrial and financial consultant, has been elected chairman of the executive committee of **Sundstrand Machine Tool Co.**

Herman A. Bottenhorn has been appointed chief engineer of Loewy Rolling Mill Division, **Hydropress, Inc.** New York.

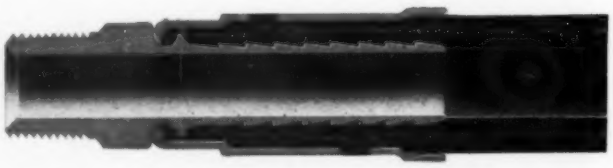
The Control Engineering Corporation has elected **George B. Foote** as vice president and treasurer. **Arthur E. Hamm,** formerly of the Foster Machine Company, has been appointed assistant to Mr. Foote.

MULCONROY *Hydraulic* HOSE ASSEMBLIES

With Triple-Grip "PRESS-LOCK" *Couplings*



With "Press-Lock" Couplings attached, Mulconroy Hose Assemblies provide a new measure of safety, efficiency and economy for all operating or control lines on every type of hydraulic equipment. They are available in three basic hose constructions, to meet any required working pressure; in a full range of sizes and in lengths up to 50 feet. Quickly and easily installed by attaching standard male threaded end of each "Press-Lock" Coupling.



Cut-away view showing unique construction of "Press-Lock" Coupling. Note that entire hose wall is employed.

Three-way gripping efficiency is provided by the "Press-Lock" Coupling, as follows: Inner section of hose wall is pressed into corrugations on stem; outer hose wall, with reinforcing wire, is displaced under pressure into openings in coupling sleeve; sleeve is anchored to collar on stem, back of hex portion.

Because the entire hose structure is employed in attaching the "Press-Lock"—no part cut away—hose will withstand shock loads and continuous flexing far beyond the limits attainable by use of conventional type couplings for this service.

Write for Illustrated Catalog

"MULCONROY *Starts...* WHERE OTHERS *Stop!*"

MULCONROY CO. *Hose Specialties Since 1887*

5329 JEFFERSON ST., PHILADELPHIA 31, PA.

Circle 72 on Reader Service Card

National Metals Exposition

The National Metals Exposition will be held the week of October 15-19 at the Michigan State Fair Grounds, Detroit. Advance space reservations indicate the meeting will be one of the largest ever held by the American Society for Metals. Many new, faster, better techniques and developments will be shown; a score or more brand-new, time saving, manpower saving machines are scheduled for their introduction at the exposition.

The first World Metallurgical Congress, drawing scientists and metallurgists from all of the free countries of the world, will meet at the same time. Sponsored by the ASM, the Congress will afford the widest technical background in metal working and processing ever offered.

The Michigan State Fairgrounds, only 8 miles from downtown Detroit on Woodward and State Fair Avenues, has ample exhibition and parking areas. An attendance of 45,000 or more is anticipated.

B. N. Ashton, president, Electrol Incorporated, Kingston, N. Y., has been appointed chairman of the Society of **Automotive Engineers A-12 Committee**, covering aircraft shock struts. The committee reviews and makes comments on military specifications related to shock struts and associated equipment. It also works on industry problems arising from new developments.

B. N. Ashton

Chicago distributors for **Bendix - Westinghouse Industrial Air Controls, Norman Engineering Company,** have moved to new quarters at 2115-17 W. Marquette Road, Chicago, 36.

In Cleveland, **C. J. Giblin** is to become manager of the Cleveland Valve Division, and **Scott A. Rogers** has been named manager of the Cleveland Jet Division.

Charles E. Cleminshaw, for the past two years manager of **Parker Appliance Company's** Cleveland Valve Division, has been named area manufacturing manager to take charge of the company's present Los Angeles plant, the adjacent fittings plant now under construction, and of Pacific sales territories as well. **Harvey E. Shroeder** will assume direction of the new fittings plant, while **R. J. Trivison** has been named manager of the Los Angeles Valve Division.

Leonard H. Seeman has joined the **Waldorf Instrument Corporation,** 103 Lafayette Street, New York City, as engineering coordinator. Mr. Seeman was formerly sales engineer and assistant to the sales manager of Greer Hydraulics, Inc.

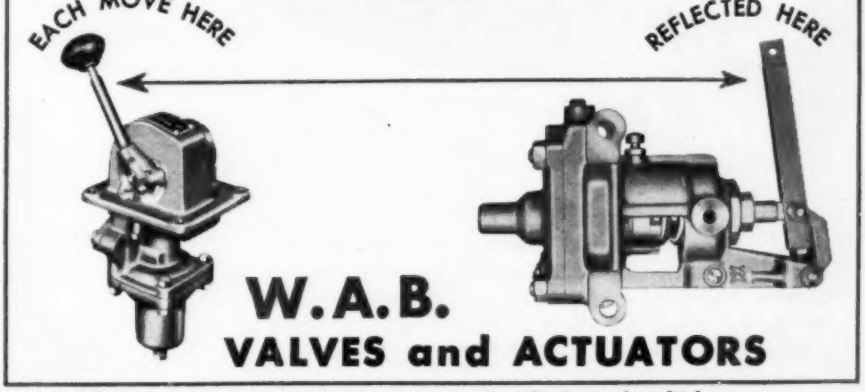
Ralph R. Layte, president, **Purolator Products, Inc.** has been elected a director of **Resistoflex Corporation.** Also elected to the Resistoflex board was **William B. Paul,** director and chairman of the executive committee of the Follansbee Steel Corporation.

New appointments by **Chiksan Company** include the following: **N. A. (Lee) Guill,** division manager of Chiksan's Chicago branch office and sales supervisor of the Chicago district, with offices at 122 South Michigan Avenue. **W. L. Clark** has been appointed sales representative in the Chicago territory and assistant to Lee Guill. **G. W. Beecroft & Co.,** 15 St. Mary St., Toronto are Chiksan sales representatives for the Province of Ontario.

Got any Problems That Call for

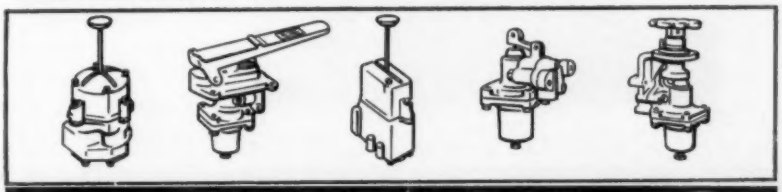
THROTTLING
GRADUATING } **CONTROLS?**
POSITIONING

Here's your Answer...



W.A.B.
VALVES and ACTUATORS

The smallest move of the control-valve handle is "echoed" by proportional movement of the actuator to throttle engines, graduate flow in process operations, positioning actuator to modulate fuel feed to boilers, etc. Eliminates complication and maintenance of mechanical linkage. Only connection is an air tube. Place controls at any distance from operation, centralize command of multiple operations. Hand, foot and cam operated valves available. Ask for Bulletin IDA 9481-1.



INDUSTRIAL PRODUCTS DIVISION
WESTINGHOUSE
AIR BRAKE COMPANY
WILMERDING, PENNA.

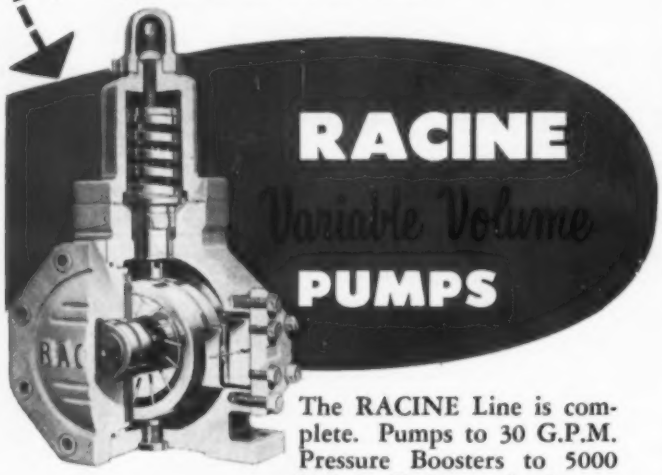
Factory Branch: Emeryville, Cal.
Distributors throughout the United States . . . Consult your Classified Directory.
Distributed in Canada by: Canadian Westinghouse Co., Ltd. Hamilton, Ontario

Circle 73 on Reader Service Card

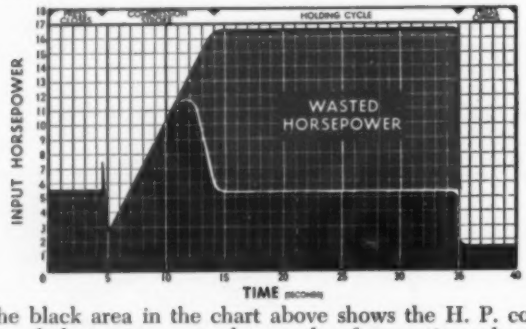
PUT ALL OF THE OIL TO WORK

Simplify the Circuit and Improve Its Efficiency

Use RACINE Variable Volume Pumps; they automatically deliver only the exact volume required. Relief valves are eliminated. Heating is reduced, horsepower saved. Over-all cost of circuit components is less. These advantages are yours when you "put all of the oil to work."



The RACINE Line is complete. Pumps to 30 G.P.M. Pressure Boosters to 5000 P.S.I. Balanced piston sleeve-type 4-way valves, straight-way valves and controls, all designed for manual electric or hydraulic operation. Complete factory and field engineering service without cost. Write for Free, complete 3-color catalog P-10-D. RACINE TOOL & MACHINE CO., 1774 State Street, Racine, Wis.



The black area in the chart above shows the H. P. consumed during one complete cycle of operation when a No. 6 RACINE Variable Volume Pump and 7:1 Pressure Booster is used. The colored area shows the wasted additional H. P. required when an efficient 2-pressure, 2-volume Constant Volume Pump of equivalent size is used. Note the savings in H. P. Chart is based on the operation of a 200-ton molding press with a 10" ram.

RACINE

STANDARD FOR QUALITY AND PRECISION

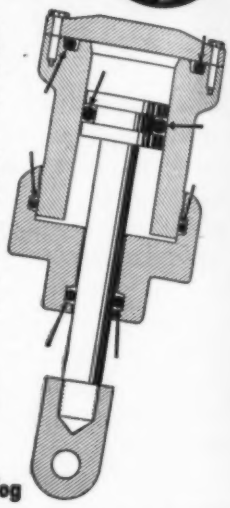
Circle 80 on Reader Service Card

Circle 78 on Reader Service Card

O-RINGS by INJECTION MOLDING

Dependable Hydraulic Seals

Minnesota O-Rings function in air or gas systems as well as in hydraulic systems. Air cylinders . . . hydraulic valves . . . hoisting mechanisms . . . water pumps . . . bottling machines . . . refrigerators . . . motors . . . lubricators . . . are a few of their uses. Minnesota's exclusive injection process makes possible very close dimensions, uniformity in mass production and downright economy. We use special compounds of synthetic rubber to meet your exact requirements. Let us quote on your next hydraulic packing installation.



Manufacturers of all types of small rubber parts

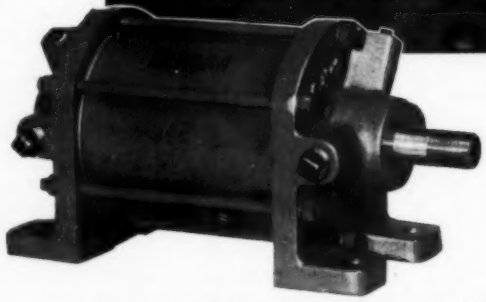
Write for O-Ring Catalog

MINNESOTA RUBBER & GASKET CO.

3642 WOODDALE AVE., MINNEAPOLIS 16, MINN.

PATHON

AIR CYLINDERS



are outstanding in performance and versatility

● Pathon double-acting air cylinders are designed to simplify and eliminate complicated mechanical linkages. These versatile compact power units are available in standard or special designs. Make your selection from the six standard models which are built in 1½ through 12 inch bore diameters, in any stroke to 144 inches. Deliveries are prompt on many mounting styles and sizes.

Pathon also manufacturers a complete line of water and oil hydraulic cylinders.

For complete details on air cylinders, write for Bulletin 12A.

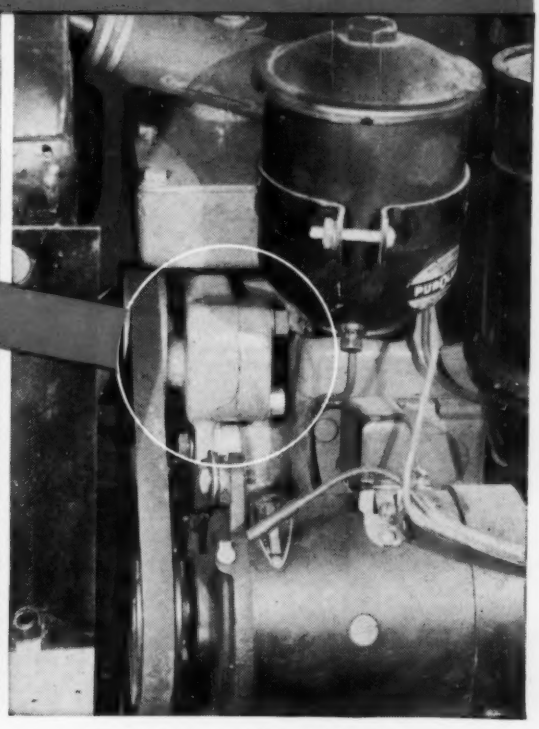
PATHON MANUFACTURING CO.

1733 Central Avenue ● Cincinnati 14, Ohio

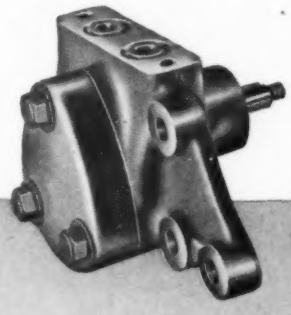
Circle 79 on Reader Service Card

Another Job for Pesco HYDRAULIC MUSCLES

"The sensitive response of the hydraulic system permits such trigger-fine adjustment that operators are loud in their appreciation," says Massey-Harris . . . *the sales power of hydraulic power in action.*



Circle shows position of Pesco pump.



Pesco pump designed for Massey-Harris Pony tractor. Capacity: 2.5 g. p. m. @ 2880 r. p. m. @ 1000 p. s. i.

Pesco *Dual Purpose* Pump Eliminates Extra Power Shaft on Massey-Harris Pony

The problem was to eliminate all unnecessary weight and cost and save space on a small tractor.

So Massey-Harris tractor engineers and Pesco hydraulic engineers teamed up . . . together came up with a specially designed dual purpose hydraulic pump to serve as both pump and fan bearing mounting.

Result: less space and weight required . . . necessity for an extra motor power shaft is eliminated.

Such teamwork between Pesco and client engineers is frequent. Matching hydraulic know-how and skills with the engineering knowledge of a manufacturer's engineering staff is the way we at Pesco like to work. It is teamwork that puts the sales power of hydraulic power to work to full advantage for our customers.

If you have a problem in hydraulics Pesco engineers will gladly co-operate with your engineers to solve it. Write today.

engineering Pesco production

PRODUCTS DIVISION

BORG-WARNER CORPORATION

24700 NORTH MILES ROAD BEDFORD, OHIO

Cricle 2 on Reader Service Card

APPLIED HYDRAULICS

goes to men who buy HYDRAULIC EQUIPMENT

...and the men who buy read APPLIED HYDRAULICS

Only the best rated, most aggressive and top APPLIED HYDRAULICS agent is selected by us to handle the distribution of APPLIED HYDRAULICS in any local area.

APPLIED HYDRAULICS agents don't specialize in any one industry, but cover every type of industry in their local area where there is a need for hydraulic equipment.

The APPLIED HYDRAULICS reader-buyers of hydraulic equipment are the top, active ledger accounts of hydraulic agents throughout the U. S.

The APPLIED HYDRAULICS agent in each local area handles APPLIED HYDRAULICS on an exclusive basis. No other agent in that area can use this plan.

We believe that it is virtually impossible for any one individual to determine who in industry and where in industry a magazine like APPLIED HYDRAULICS should go to reach the proper buying influences. After all, advertisers and potential advertisers in APPLIED HYDRAULICS are specialists, and they must reach specialists in order to sell.

Our solution to this problem is to put the circulation of APPLIED HYDRAULICS in the hands of more than 300 circulation managers. These circulation managers are the salesmen for the hydraulic agents throughout the country who subscribe to APPLIED HYDRAULICS for their customers.

Hydraulic equipment salesmen, covering the plants in a local area intensively, know better than anyone else who the men are that should be reading APPLIED HYDRAULICS. The names of these men are supplied to us by the agent, and the agent pays us for sending the magazine to these men.

Whether you, as a manufacturer, sell direct or through agents, the reader-buyers of APPLIED HYDRAULICS Magazine are the men in industry to whom you must tell your sales story. Only APPLIED HYDRAULICS in the hydraulic field offers you 100 percent authenticated buyer circulation.

APPLIED HYDRAULICS

1240 ONTARIO STREET CLEVELAND 13, OHIO